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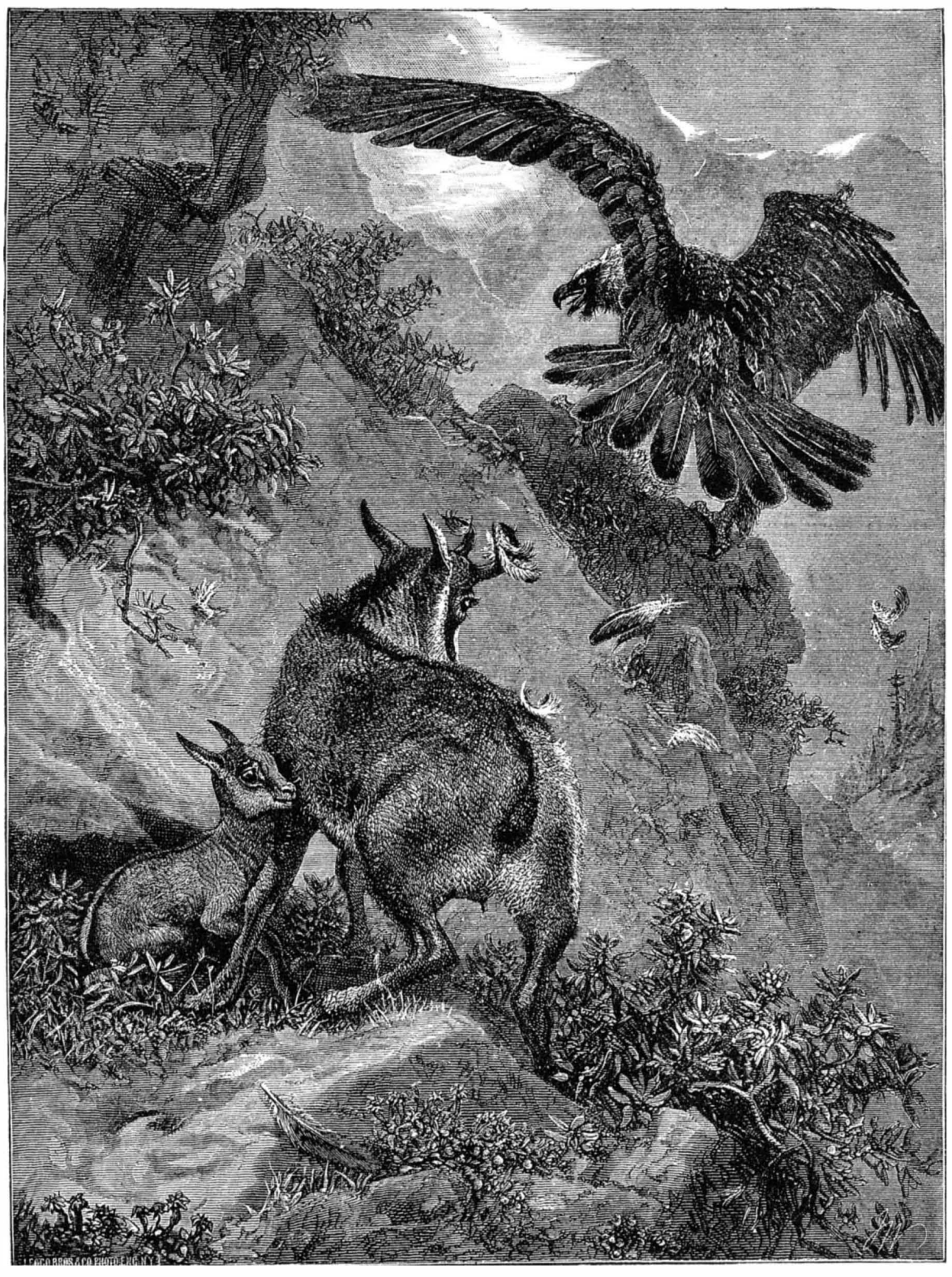
Vol. XXXIV.—No. 25. [NEW SERIES.] NEW YORK, JUNE 17, 1876. [$3.20 per Annum [POSTAGE PREPAID.

THE LAMMERGEYER OR BEARDED VULTURE.

The bearded vulture, called in Germany (where it is most common) *lammergeyer*, is the largest and most powerful of European birds of prey; and its German name is derived from its propensity to seize and carry off young lambs, a feat for the performance of which a bird must be largely endowed with strength and audacity. The bearded vulture, when fully grown, is about 4 feet high, measuring from 9 to 10 feet from tip to tip of its wings; the head and neck are completely clothed with feathers, and the base of the bill is hidden by projecting bristles; the bill is long, strong, straight, and laterally compressed, with the tip curved and sharp; a tuft of stiff bristles projects forward like a beard from the base of the lower mandible; the wings are long, the second and third quills being the longest and nearly equal; the tarsi are short and covered with feathers; the anterior toes are united at the base with a membrane; and the claws, especially those of the inner and hind toes, are curved. In the adult bird, the upper part of the head, the neck, and the under parts are whitish, tinged with orange, deepest on the breast; the wings and tail are grayish black, and the back deep brown; the wing coverts are dashed with orange white; the beard and the space round the eye are black, and the bill horn-colored. The bird is found also in Asia and Northern Africa.

It is by no means uncommon for the *lammergeyer* to frighten its prey over a precipice, and then to descend and devour the carcass. In the admirable engraving* presented herewith, its strength and ferocity are shown to be successfully resisted by the maternal instinct of the chamois whose pavid offspring, well aware of the besetting danger, crouches in timidity behind its mother. The upward thrust of the chamois' head, armed with short, firm, retroverted horns, has evidently struck the marauder a severe blow, and his affrighted scream is almost audible as we look on his spread tail and displaced feathers.



DOE AND FAWN ATTACKED BY A VULTURE.

Use of Steam Carriages.

The mechanical difficulties in the application of steam as a motive power for carriages have gradually come to be appreciated; and with the somewhat more complete knowledge of the conditions and requirements, it is probable that the next attempts, made in earnest by skilled and informed mechanics, will effect more satisfactory results. It is a settled conclusion that the adhesion of the wheels, or of a pair of them, sustaining half the load, is ample for the purpose of impulsion at any grades practicable for ordinary road use, only noticing that the contact or bearing of the drivers upon the ground must be positive and uniform. A four-wheeled vehicle with axles attached to a rigid body, when standing or running on the uneven—generally twisted—surface of a road, will obviously rest or have its bearing only upon three of its wheels, and this condition of three points of bearing attaches to the tram road locomotive, as well as to the common road one. Balance bars or gimbal-hung swinging axles will secure the equal distribution of weight upon drivers, or, what in the road carriages is equally essential, on directing wheels. The possibility of driving around any curve, as the directing wheels may lead or trail, is secured by the jack-in-the-box motion of the traction engine, which applies the force to either driver of a pair of wheels, imparting to either wheel, in whatever proportion is requisite, the motion or rotion it should have when running upon a curved line. Of course, the abrading action of the tires (like that of the faces of a mortar mill) upon the ground yet remains; and the wear on them and on the road bed at the place of turning will still be large, but the leverage to overcome this grinding, and the amount of grinding, will be so much less than that which accompanied the action of wheels rigidly attached to an axis that it can be surmounted or endured. The conditions of leading the tram road carriage around the curve differ altogether from those of guiding the ordinary road carriage. The tram road carriage will guide itself, with either the Bissell two-wheeled truck, or more perfectly still with the old German six-wheeled wagon arrangement (in which the axles adjust themselves radially to any line of curvature); while the ordinary road carriage must have the swinging axle only for a guide.

In the application of power to the steam carriage, it is apparent that the starting resistance is the most difficult to overcome; and although many methods suggest themselves, none has yet had practical application in service in parallel work. The utilization of the momentum of stopping may be available to help the starting of a carriage. This has already been elucidated as possible on railway trains; but in this case the gain from all the momentum lost at a stoppage bears so small a proportion to the labor of the locomotive engine as not to be worth saving. The necessity of two speeds, at least, is acknowledged; but with the gearing of the jack-in-the-box, there is no great objection to double speed wheels in addition. The total motive power of the engine demanded is about what is rated at two horse power, at the most, and the engine becomes very small. The success of the three-cylinder engine, now made by the thousand, almost, in England, and its peculiar facility for the use of the expansive force of steam at high velocities, seems to open a ray of light into the darkness where the steam carriage of the future now lays. The recognition of the fact that the interstices of a mass of coal, on a given surface, present an equal area for any size of lump, whether coarse (large) or fine, only that all the lumps or grains must be sorted to the same size, is slowly being made; and as our fine anthracite coal, of pea size, runs like water, it follows that automatic firing of the small boiler will be the finality for the purpose of the steam carriage (as well as the possible finality of the firing of marine, if not all, steam boilers). This, with suitable automatic arrangement for feeding, will permit the steam carriage to be run by one man alone. Only some of the salient points of the mechanism of the coming carriage have been noticed here; others of nearly equal importance present themselves, which can be discussed or settled in the same way, by those especially interested.

Eventually, the steam carriage will be as distinctive as the locomotive engine, and will have its nationalities as the locomotive has, and its individuality, as the American locomotive of to-day has William Mason inscribed upon it.

The steam carriage, when in use on the public highways or tram tracks, will be much more safe from accident of any kind than the ordinary vehicle or the street car. The requirement or penalty can be made as stringent, as letting all statute laws out of the question will allow the enforcement of common law; and under the impulse of such penalties—safeguards, catchers, detenters or arresters—automatic contrivances of all kinds will multiply to the point that will give security to the other traffic, quite as great as that now attendant upon the average driver and the carriage horses; while the control of the apparatus, either to start or to stop, can be made certainly as effective as the present ordinary carriage, however carefully driven.—*Journal of the Franklin Institute.*

*From "The Life and Habits of Wild Animals," illustrated with designs by Joseph Wolf, engraved by the Brothers Whymper, and published by Messrs. Macmillan & Co., of London and New York.

HARDENED GYPSUM, boiled with stearic acid or paraffin, much resembles meerschaum. The resemblance may be much increased by coloring the mixture with solution of gamboge and dragon's blood.

A PIECE OF WOOD cut from a tree is a good electrical conductor. Let it be heated and dried, it becomes an insulator. Let it be baked to charcoal, it becomes a conductor again. Burn it to ashes, and it becomes an insulator once more.

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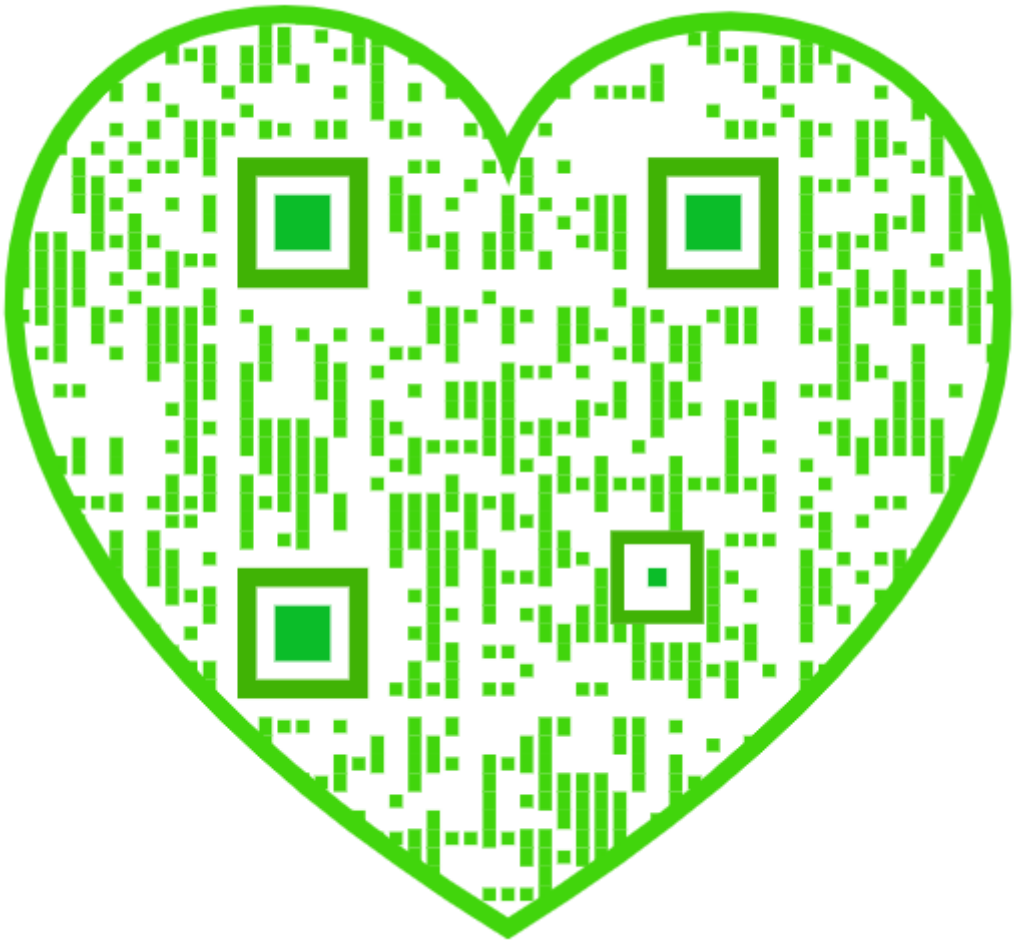

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DARWIN'S THEORY OF PANGENESIS.

Seven years ago, Mr. Charles Darwin first presented the theory of pangenesis. After continued study during the interval, he now reaffirms the hypothesis, and once more submits it, remodeled and fortified by a host of new facts and observations, in the recently issued second edition of "Animals and Plants under Domestication." The doctrine of natural selection presupposes variability as a necessary characteristic of every organism, and this theory has been substantiated by a vast aggregation of observed facts. Of this accumulation, the work above referred to forms no inconsiderable part, since it deals with observations showing the amount and nature of the changes which animals and plants have undergone while under man's dominion, or which bear on the general principal of variation. It is in order to bring all the phenomena of diversity in growth under one law that Mr. Darwin enunciates a supposition which implies that every separate part of the whole organization reproduces itself. So that ovules, spermatozoa, and pollen grains, the fertilized egg or seed, as well as buds, include and consist of a multitude of germs thrown off from each separate part or unit. This connects and serves to explain a series of phenomena otherwise isolated and inexplicable; and of these a brief analysis is necessary to the proper comprehension of this very important and far-reaching theory.

Reproduction may be divided into two classes, namely, sexual and asexual. The latter is effected in many ways, by the formation of buds of various kinds, and by fissiparous generation, that is, by spontaneous or artificial division. Between the production by fissiparous generation of two or more complete individuals and the repair of even a very slight injury, there is so perfect a gradation that it is impossible to doubt that the two processes are connected; and thus the several forms of budding, fissiparous generation, the repair of injuries, and development are all essentially the results of one and the same power. From well understood cases of parthenogenesis and a variety of other instances, the distinction between sexual and non-sexual generation is proved to be not nearly so great as hitherto supposed, and in fact they do not essentially differ; and therefore Mr. Darwin concludes that, with the power of regrowth and development, they are parts of the same law.

A few of the more striking phenomena, coördinated under this law, may first be examined. A multitude of the lower animals and vertebrates possess the wonderful power of reproduction of amputated parts. Spallanzani cut off the legs and tail of the same salamander six times successively. Tadpoles are capable of reproducing lost members, though full grown frogs are not. A crab regains lost legs; and gasteropod mollusks, whose heads are likely to be bitten off by fishes, have the power of reproducing those important members. In the case of those animals which may be bisected and chopped to pieces, and of which every fragment will reproduce the whole, power of regrowth must be diffused throughout the whole body.

It is well known that buds may be inserted into a stock, and that plants thus raised are not affected in a greater degree than can be accounted for by changed nutrition. From this every-day, though little understood, operation of grafting is deduced the very important fact that formative elements capable of blending with those of a distinct individual (and this is the chief characteristic of sexual generation) are not confined to the reproductive organs, but are present in the buds and cellular tissue of plants.

A marvelous series of phenomena grow out of the circumstance that in the case of plants the male element may affect in a direct manner the tissues of the mother, and with animals may lead to a modification of her future progeny. Gallesio fertilized an orange flower with pollen from the lemon, and the fruit bore stripes of perfectly characterised lemon peel. Not merely is the ovule affected, but the partially developed tissues of a distinct species, as is exemplified in a case where an Arabian mare bore a hybrid to a quagga. Subsequent colts by an Arabian horse were more striped even than the quagga itself, and presented other marked characteristics of that animal. Another well known instance is that of a fine bred slut, which, when once crossed by a mongrel, frequently thereafter bears none but tainted offspring, and is thus ruined for breeding purposes. Among human beings, the children of a woman by her second marriage often exhibit traits peculiar to her first husband.

We next reach the question of development, which is either slight and slowly effected, as in human beings, or great and sudden, like the metamorphoses of insects. By several distinct groups of facts, Mr. Darwin is led to the belief in the independence of parts successively developed. Again, physiologists agree that the whole organism consists of a multitude of elemental parts, which are to a great extent independent of each other; and a most curious array of facts may be adduced to support this view. The spur of a cock, after being inserted into the ear of an ox, lived for eight years, became nine inches long, and acquired a weight of nearly fourteen ounces. The tail of a pig has been grafted into the middle of its back, and reacquired sensibility. Ollier inserted a piece of periosteum from the bone of a young dog under the skin of a rabbit, and true bone was developed. A French zouave once drove a thriving trade in Paris by selling marvelous rhinoceros rats. He imitated the horn of the rhinoceros by grafting a freshly removed rat's tail to the forehead of a second rat.

Lastly, we meet the phenomena of variability and inheritance. Variability is not a principle coördinate with life or reproduction, but results generally from changed conditions acting during successive generations. By inheritance a multitude of newly acquired characters are acquired by offspring. A horse becomes trained to certain paces, and the colt inherits similar consensual movements. A retriever taught to fetch and carry will transmit its endowments to its descendants. On the whole it may be concluded that inheritance is the rule and non-inheritance the anomaly. Reversion is not a rare event, but occurs so regularly that it is evidently an essential part of the principle of inheritance. In fine, in every living creature we may feel assured that a host of long-lost characters lie, ready to be evolved under proper conditions.

It is clear that, through all of these phenomena, there may be traced a possible action of the innumerable elements composing every organism, each possessing its own attributes and to a certain extent independent of all the others. Now it remains to connect all under the law. It is universally admitted that the units of the body increase by self-division or proliferation, retaining the same nature, and that they may ultimately become converted into the various tissues and substances of the body. But besides this means of increase, Mr. Darwin assumes that the units throw off minute granules which are dispersed throughout the whole system; that these, when supplied with proper nutriment, multiply by self-division, and are ultimately developed into units like those from which they were originally derived. These granules may be called gemmules. They are collected from all parts of the system, to constitute the sexual elements, and their development in the next generation forms a new being; but they are likewise capable of transmission in a dormant state to future generations, and may there be developed. Their development depends on their union with other partially developed cells, which precede them in the regular course of growth. Gemmules are supposed to be thrown off by every unit, not only during the adult state, but during each stage of development of every organism: but not necessarily during the continued existence of the same unit. Lastly, it is assumed that the gemmules in their dormant state have a mutual affinity for each other, leading to their aggregation into buds or into sexual elements. Hence it is not the reproductive organs or buds which generate new organisms, but the units of which each individual is composed. These assumptions constitute the provisional hypothesis, to which Mr. Darwin has given the name pangenesis.

ANOTHER DASTARDLY ATTACK!

The Chicago *Tribune* says: "The wrongs of women and negroes have monopolized public attention for many years. Serious as some of them are or have been, the wrongs of boys are as bad, if not worse. For a series of years, the boys of America have been shut out, more and more completely with each year's advance, from the chance of learning a trade. The trade unions, with almost incredible blindness, have adopted rules which prevent the employment of any except a very limited number of apprentices. These rules forbid a master to employ an apprentice unless he employs a certain number of journeymen; and in some trades, the proportion is one boy to twenty men. The few places left vacant by apprentices becoming journeymen are soon filled. Tens of thousands of boys are thus deprived of the opportunity to become reputable and self-supporting artisans. When they leave school and try to do something for themselves, they find the doors shut in their faces. Instead of becoming blacksmiths, silversmiths, carpenters, compositors, cabinet makers, coachmakers, hatters, machinists, bakers, tanners, tinners, tailors, masons, shoemakers, stonecutters, plasterers, bricklayers, weavers, they have to become bootblacks, newsboys, errand boys, loafers, dead-beats, paupers, thieves, etc. No one of the occupations open to them offers any education, except in a sort of cunning which is often a curse. If the members of the so-called liberal professions, the journalists, lawyers, teachers, doctors, and ministers, should successfully combine to prevent the education of boys and young men in any of their specialties, there would be a universal howl of complaint. A far greater wrong is committed, however, when trade education is prevented. Many more boys are affected, for one thing, and most of them must go to work at once and labor constantly in order to live. If they do not this, and do not steal, they must starve."

When will respectable papers, like the Chicago *Tribune*, learn to cease such dastardly attacks as the above upon the workmen of our country and their trade societies? The workers comprise the vast majority of the population. Is not all the wealth of the country the result of their labors? Do they not pay the taxes? Do they not support the government, as well as their own families? If they prefer to do all the family work in person, shall they not enjoy the privilege? To be sure, their boys would be benefited by industry; their mothers and sisters would be rendered more comfortable and happier if the family income were increased by the earnings of the lads. But if the fathers, who form and govern the societies, prefer to do all the work, and exclude the young fellows, it is their privilege, and the Chicago *Tribune* need not complain about it.

Not long ago, the legislature of this State passed a bill requiring that felons and other criminals in certain prisons should be compelled to work. It costs, say, $2 a day to support each one of these rogues, which expense, as everybody knows, is paid, indirectly, out of the earnings of the working people. But strange to say, the moment the bill passed, the Governor was waited upon by officers of trade societies, representatives of the working masses, the voters, requesting that the bill should be vetoed. Labor, they argued, is so scarce that, if the thieves are allowed to work, we honest people will have nothing to do. "Very well," perhaps thought the Governor, "it is your own affair. You may continue, since you prefer it, to tax your earnings and distress your families, in order to support these wretches in idleness." So the bill was vetoed.

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VORTEX ATOMS.

Any one who has ever witnessed a cannonade on a still day can hardly have failed to remark the great rings of smoke, which often arise from the cloud belched forth by the guns, and float aloft for a considerable period before becoming dissipated. The same rings are produced on a small scale by smokers of tobacco, by a sudden expulsion of air from the mouth, the lips being placed in a peculiar position. There is also an easy way of making them for purposes of examination, which consists in providing a box having a round aperture at one end, and its opposite extremity covered only with cloth. The bottom is sprinkled with a strong solution of ammonia, and a dish of common salt and sulphuric acid is inserted. The gases arising from the salts and acid combine in the shape of smoke, and the latter may be expelled in beautiful rings through the aperture by striking suddenly on the cloth back.

When the behavior of these rings is critically investigated, it appears that they have peculiar properties. When two impinge, they act as if made of solid elastic material, and vibrate independently after the shock; or vibrations may be produced in them by ejecting them through a square instead of a circular hole. The circle is the position of equilibrium, and the irregularly-shaped ring vibrates about that form. Another curious result is that, if the two rings are moving in the same direction, with their centers in the same line and their planes perpendicular to that line, the pursuer contracts and moves faster, while the pursued expands and moves more slowly, so that they alternately pass through one another. If they are moving in opposite directions, under like circumstances, both expand indefinitely, and more slowly and slowly, never reaching one anoth r.

Now each ring or vortex contains not merely the matter in fine division forming smoke, but a certain definite proportion of smoky air, which, in virtue of the vortex motion, has become a different substance from the surrounding air, and moves through it very like a solid body. If there were no such thing as fluid friction in the atmosphere,the ring would go on moving for ever ; and not only this, but the portion of the fluid containing the smoke and marked thereby would remain precisely the same set of particles of the fluid as it moved through the rest. Consequently those thus marked by the smoke would be,by the fact of their rotation,differentiated from the surrounding atmosphere, and could not by any process short of an act of creative power be made to unite with the latter.

Helmholtz has shown that the properties of every vortex ring are, first, that every part of its core is essentially rotating. As a ring approaches the observer, every portion of the inner side is moving forward, and every portion of the outer side is moving backward; and if the face be placed in the path of a large ring, a sudden blast of air will be felt flowing through the center of it. Thus the vortex ring not only involves in itself rotating elements, distinguished from other elements of the fluid, but it also is associated necessarily with other movements through the non-differentiated air, and especially a forward rapid current of air, passing through its center in the direction in which it is going. Helmholtz has further shown that such a ring is indivisible. The sharpest knife will not cut it. It wriggles around the blade and moves away. It is not that it cannot be cut, but you cannot so much as get at it so as to try to cut it.

Again, vortex filaments existing in a continuous medium of any kind must either be endless, or else the ends must be in,the free surface of the liquid. The last condition any one can realize by drawing his teaspoon over a cup of tea and lifting it from the surface. There will be a couple of little whirlpools going round in the tea, rotating in opposite directions, the two moving forward (as do their sides which are nearest one another) in the direction in which the teaspoon was drawn. These two little eddies are simply the ends of a half vortex ring, and they are on the free surface of a liquid.

We are now in a position to understand Sir William Thomson's recent theory of vortex atoms, which Professor Tait explains in his "Recent Advances in Physical Science,"* from which we have freely drawn for the foregoing. We have shown that, given a perfect fluid, nothing but creative agency could produce a vortex ring in it, or destroy one already there. No process at our command could enable us to do either; because in order to do it, fluid friction is essentially requisite. Now, by the very definition of a perfect fluid, friction does not exist in it. Sir William Thomson suggests that the Universe is filled with something which we have no right to call ordinary matter (though it must possess inertia) but which we may call a perfect fluid. In this vortex, motion once produced by creative act remains until the same power removes it, Thus, he argues, this property of rotation may be the basis of all that to our senses appeals as matter. All atoms of matter are vortex rings; and in a perfect fluid filling all space and having no surface, there can be no ends. All vortex atom rings, therefore, must be endless, that is to say, must have their ends united together after any number of convolutions. Lastly, the indivisibility of a ring shows that, in that sense, at least, it is literally an atom.

This idea enables us to explain a great many properties of matter, but it carries with it a host of mathematical difficulties. The theory has but passed its first trials, and, being admitted as a possibility, it is left to time and the mathematicians to settle whether really it will account for everything experimentally found. If it does so, and if it, in addition, enables us to predict other phenomena, which in their turn shall be found to be experimentally verified, it will have all the possible claim on our belief that any physical theory can ever have.

THE CENTENNIAL EXPOSITION.

The attendance at the Exposition is now steadily increasing. On Decoration Day, fully 50,000 people passed the gates, and the Main Building and Memorial Hall were, for the first time, uncomfortably crowded. The twenty-eight groups of judges have completed their organization, and the members are busily at work preparing their reports. The system adopted of dividing the duties, each member making his own examination of the articles submitted, instead of requiring the exhibits to be investigated by committees of several judges, as has heretofore been done in other expositions, is said to work admirably, saving an immense amount of time to the commission, and, without doubt, it will give as good satisfaction to the exhibitors. Considerable comment has been aroused regarding alleged injuries to the pictures committed by careless visitors, and the Austrian Commission had their gallery closed until railings around the works of art were erected. It has since been found that but two pictures were damaged, and in neither case could the mishap be charged upon visitors, as the injuries were discovered to have occurred during transportation. Horticultural Hall, in which the display at the opening was not large, is being rapidly filled. The latest arrival is a fine selection of tree ferns from Australia. The English rhododendrons are now in full bloom, and present a magnificent appearance, although they show evidence of the long voyage disagreeing with them. A much handsomer display of these beautiful flowers may be seen at the present time in Llewellyn Park, Orange, N. Y. Between the British Government and the T. A. B. fountain, a Canadian lumber merchant has erected a house built of rough lumber, just as it comes from the yard. The roof is made of huge unbarked timbers, each twenty-four inches in diameter, and the sides are composed of boards piled to form a wall a foot thick. Inside, a monster section of a pine tree is exhibited. The big Krupp cannon has at length reached the grounds, and is being placed in Machinery Hall. The pumps annexed to that building are now at work, producing a miniature Niagara for three hours daily. The Brewers' Building is rapidly approaching completion. A curious section of elevated railway is being constructed between Agricultural and Horticultural Halls. The cars are built something after the Swiss cottage pattern.

THE JAPANESE BRONZES AND LACQUERED WARE

we have already alluded to, as one of the most remarkable portions of the general display. The grotesqueness of Japanese art is employed in these with wonderful effect. There are cups and saucers of lacquered wood, as light as corks, colored with reds, blues, and yellows, protected by the famous Japan varnish, which will withstand the hottest water. Perfection of joiner work, unique ornamentation, and exquisite selection of colors are especially noticeable in the cabinets, some of which, scarcely larger than a modern music box, range in price from $125 to $1,000. It is in the modeling and the preliminaries to the casting of the bronzes that the peculiar genius and perseverance of the Japanese are disclosed. The models are made in wax ; and in that material everything, down to the smallest feather of a bird's wing or the hair of a spider, is elaborated with scrupulous care. The wax model is then painted all over with a coating of finest sand, held together by a fireproof mucilage. The first coat is laid on with exceeding care, so as to fill every tiny interstice. So with all following coats,which may number hundreds, until sometimes six months are consumed in the work of painting a cumulative mold three or four inches thick. When the latter is rendered sufficiently strong, the wax model inside is melted and removed. The bronze is then poured in, and the whole object completed in a single casting. The mold is subsequently removed with care only second to that employed in its construction, leaving the bronze without a crease or flaw. From this process emerged the magnificent incense bearer which stands at the entrance of the Japanese section. It represents a vessel elevated upon worn sea rocks, inhabited by a dragon and surmounted by an eagle and flanked by flocks of birds. The price was $4,500, and it was purchased for the English South Kensington Museum.

As there are no patent laws in either China or Japan, the mode of preparing the patina given to these bronzes has remained secret for ages, and has been handed down from father to son. Chemical analysis has, however, revealed the composition of the alloys, and M. Morin has discovered that the patina of the celebrated black bronzes is due to the use of an alloy composed of 80 per cent of copper, 4 of tin,10 of lead,2 of zinc, 4 of iron, besides small proportions of gold, nickel, arsenic, and sulphur. Some of the bronzes analyzed show a proportion of lead varying from 10 to 20 per cent, added at the expense of the copper, and a quantity of 7 per cent of tin. Molded in thin plates,this bronze is very easily worked, and the patina appears of itself when the metal is subjected to a high temperature in a muffle furnace. It is, however, very brittle. Chemical analysis is certainly of little use in this case, unless it leads to synthesis; and in that respect the labors of the French investigators have been attended with remarkable success, and have resulted in the production of bronzes even better than those of the Japanese, since they have a strength equal to that of ordinary bronze. The process consists in preparing a ground by the action of chemicals having oxides and sulphides of copper as their bases. If different tints, black, brown, red, or green, be desired on the same object, it is sufficient to cover with a protecting varnish all portions of the surface except those to which it may be desired to give a certain hue; then when they have been treated for a sufficient time, they are covered with varnish, while the other parts of the surface now exposed are subjected to the action of the chemicals, and so on for as many tints as are required. The inlaid enamel work which is performed by oriental artists with so much skill and patience, and at the same time with such primitive appliances, is now executed by simpler and quicker means. The object to be inlaid is entirely covered with varnish, portions of which are removed by a graver so as to form the design; and thus prepared, it is subjected to the action of a galvanic bath of gold or silver, which deposits the metal in the places laid bare by the graver. Another method is, however, mentioned by M. Morin. After the removal of the varnish, according to the pattern made by the graver, the object is plunged into a solution of cyanide of silver. The salt is deposited on the lines from which the varnish has been removed; the object is heated in a muffle furnace, and the metal appears on the black patina. Inlaid patterns of gold and silver may be obtained, either of their natural brightness or with a dead surface, the latter being effected by different processes of oxidation ; so that, on the same object, by making use of the protecting varnish, designs in gold and silver of various degrees of luster may be combined.

THE ENGLISH ENAMELS.

It is a notable fact that the present specimens of Japanese and Chinese enamels are fairly approximated by those exhibited by the Messrs. Elkington,of Birmingham, in the English section. The *cloisonnée* work forms an imperishable picture capable of resisting everything but intense heat and great violence, and is a material which lends itself with especial readiness to rich and harmonious coloring; while the delicate bright metallic lines bordering the *cloisons* form a pleasing contrast to the comparative dullness of the opaque glass.

THE RUSSIAN EXHIBIT,

which two weeks ago existed only in packing boxes,now bids fair to attract remarkable interest. Portions of it will remind one of the famous reply of Prince Demidoff, who, when a lady somewhat ostentatiously exhibited to him a set of malachite jewelry, carelessly remarked: "Yes, I have a mantle piece made of that." From the celebrated mines owned by the above dignitary, several superb malachite urns, table tops, and mantle pieces, have been sent, valued at several hundred dollars each. There is besides a pair of *lapis lazuli* vases in this collection, valued at $500. The Russian machinery is not yet in place; but as thirty car loads arrived in a single day recently, a fine display may be anticipated.

MEXICO

astonishes visitors to her section by exhibiting a circular mass of pure silver weighing 4,000 lbs., and valued at $72,000. The mineral contribution of this country is exceptionally good. There are some fine cannel coal and a collection of beautiful opals and precious gems imbedded in ore. In textile manufactures, Mexico compares favorably with other nations, and exhibits cloths and cassimeres of the finest workmanship. There is a large display of medicinal plants, coffee, and tobacco, and also a valuable exhibit,showing the many uses of the agave. The fiber of this plant is made into rope, paper, and cloth, and its flower yields an intoxicating drink called *pulque*.

SWEDEN

carries off the palm for the best show of iron and steel. Twenty-eight exhibitors contribute, and among them the two largest establishments in the kingdom, those of the Molota and of Sandark. Huge columns, pyramids of iron and steel bars and pipes, and great screens towering to the roof of the building, on which are arranged tires, bars, and ingots, are on every side. A very tasteful exhibit is the bow of a Viking's vessel,the mast and rigging of which are made of various forms of iron; and the ornamentation is entirely composed of the same metal, in the shape of rivets, nails, etc. Professor Lödermann's plaster figures attract a great share of attention ; and they embody admirable representations of the costumes and appearance of the Swedes and Laplanders. Such great care is taken to insure absolute correctness in details that, when the hand of one of the figures was broken in transit, it was supplied by a cast taken from the hand of a Swedish girl in the employ of the commission. The expressions of the countenances and the attitudes of the figures are wonderfully natural. One of the groups represents a hunter and his family, gathered in front of a deer that has just been shot. Another admirable group is that of a Laplander,in his sledge drawn by a reindeer, who stops to chat with a fur-clad woman carrying her baby slung to her neck in a kind of trough. There are various other groups,representing bridal parties and household gatherings, equally fine. Numerous cases of matches form a prominent feature of the Swedish exhibit, for with this commodity Sweden furnishes all Europe. Some of the finest carpentry work in the Exposition is shown in two garden pavilions contributed by a Stockholm maker. A large collection of building stones illustrates the richness of the country in these materials; and a table of red porphyry, with mosaic work in many colored stones,forming a center piece,exhibits the skill and taste of the Swedish artisans using them. The woolen fabrics displayed are as good as those in the English department, and excel those contributed by Germany. The ceramic collection contains many curious objects. The most striking is a porcelain stove about 12 feet high,of a delicate blue, ornamented in gold and darker blue. Its price is $1,000. There is also a peculiar kind of ware made apparently of *répoussée* silver and porcelain. The notice of the Swedish exhibits in the Machinery and Agricultural Halls, we are obliged to defer till another issue.

EQUAL parts of fine filings of zinc and tin, mixed with sufficient mercury to form a thick paste, and pulverized when partly hardened, makes an excellent amalgam for electrical machines.

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INDUSTRIAL APPLICATIONS OF CARBONIC ACID.

LECTURE DELIVERED AT THE STEVENS INSTITUTE OF TECHNOLOGY, BY PROFESSOR A. R. LEEDS.

The list of investigators of carbonic acid begins at the opening of the seventeenth century with the Dutch philosopher Van Helmont. It was then known as *spiritus sylvestris*, and the word *spiritus*, being translated literally, became *geist* in German and ghost and gas in English. The word gas was originally employed in connection with carbonic acid. Van Helmont recognized the identity of the gases evolved in fermentation and in the burning of lime. He also pointed out the fact that the poisonous gas in the Grotto del Cane, in Pyrmont, and that obtained from limestone by the action of acids, were the same *spiritus sylvestris*. As an example of the crude analysis of his time, we read that he burnt 62 lbs. of wood, from which he obtained 61 lbs. of ashes, which leaves a difference of 1 lb. for carbonic acid. Hoffmann, the next investigator, discovered that this gas reddened the blue coloring matter of litmus. The Scotch philosopher Black proved that this gas must be entirely different from air, and recognized the fact that it was an acid. The lecturer then showed the action of carbonic acid on lime water. A perfectly clear solution of the latter was at first rendered turbid and milky from the precipitation of carbonate of lime; and then, on continuing to pass the gas through it, it became clear again from the resolution of the carbonate of lime by the excess of the carbonic acid. This circumstance showed Lord Cavendish that the water of springs, rivers, etc., containing carbonic acid, could take up lime and other earths from the soil and deposit them again on evaporation of the gas. This is the origin of the troublesome boiler incrustations. It was next shown that the gas exhaled from the lungs was carbonic acid, by applying the lime water test. The lecturer showed this experiment by means of a little glass tank filled with clear lime water colored by litmus, which was placed in the lantern and reflected on the screen. On passing the breath through the solution, the color changed to red, and the turbidity arising from the precipitation of carbonate of lime was apparent on the screen.

The first industrial investigation of carbonic acid was made by no less a person than Dr. Priestley, the discoverer of oxygen. He resided near a brewery, and studied the gas given off there on a large scale by fermentation. His experiments were illustrated by Professor Leeds, who had a large vessel of fermenting malt liquor on the stage. A lighted match held above the liquor was instantly extinguished. The gas being very heavy, it could be scooped out with a quart measure, and poured from one vessel into another without danger of loss. After pouring it back and forth several times, a candle was extinguished by merely emptying the vessel over it. Water poured back and forth, in the atmosphere of carbonic acid contained in the large vessel of malt liquor, absorbed a sufficient quantity of the gas to become milky on the addition of lime water. Priestly thought that the antiseptic properties of this body could be utilized by impregnating water with it, and conducted the gas made from limestone into a vessel of water by means of a leather tube.

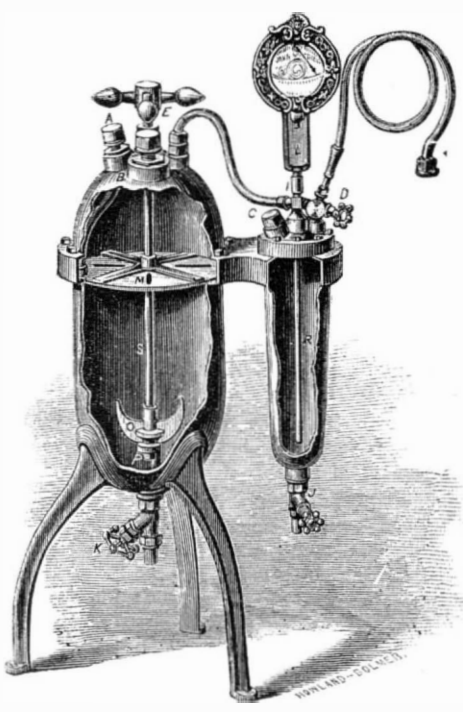

Fig. 2.—GAS GENERATOR AND WASHER.

From this primitive device of Priestley to the beautiful and elaborate apparatus of Mr. John Matthews, of this city, which was exhibited upon the stage and is represented in Fig. 1, was indeed a giant stride. On the left is the gas generator, the construction of which will become clear by inspection of Fig. 2. From the generator, the gas passes through a smaller vessel containing water, which washes it, and is then conducted into the fountain on the right under high pressure. Fig. 2 exhibits the internal arrangement of the gas generator and washer. A mixture of sulphuric acid and water is introduced through the bung, A, and the marble dust is poured in through B. The acid liquor passes to the bottom of the vessel; but the marble dust is arrested by a diaphragm, M, furnished with several slits, through which the marble dust is made to sift when the shaft, S, is caused to revolve by turning the handle, E. At the same time the agitator, O, facilitates the evolution of gas by keeping the mixture constantly stirred. As soon as a pressure of 105 lbs., indicated by the gage, L, is reached, the stop valve, G, of the fountain (Fig. 1) is opened, and the gas is made to pass into it slowly, by gradually opening the stop valve, D, of the gas washer. When enough gas has come over, the valves are closed, the pipe, F, is disconnected, and the fountain is made to revolve in its frame for about ten minutes to aid the absorption of gas by the water. It is then ready to be placed in one of those artistic Matthews soda water apparatuses, which are so familiar to all as to need no description. The generator and fountain just described are made extremely strong and constructed with the utmost care, not only to prevent accidents from explosions, but also to obtain a product of the utmost purity. They are lined throughout with tin, and all the connections are covered with the same metal. If the sulphuric acid came in contact with iron, hydrogen would be generated and would contaminate the gas; if the carbonic acid liquid came in contact with

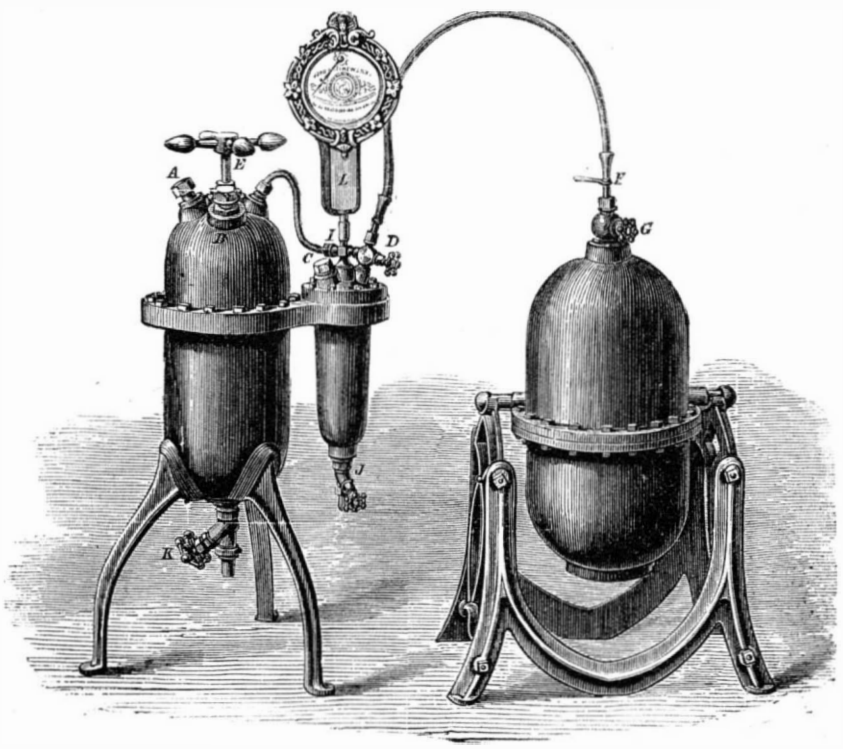

Fig. 1.—CARBONIC ACID GAS GENERATOR.

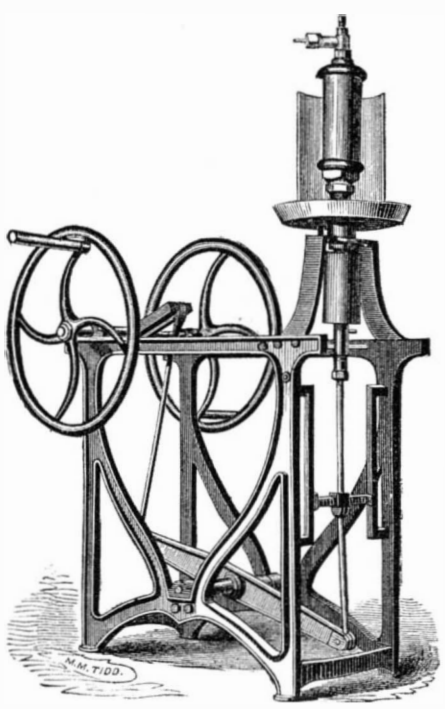

Fig. 3.—LIQUEFYING AND SOLIDIFYING CARBONIC ACID

lead, it would dissolve enough to produce poisonous effects. To illustrate the solution of lead by carbonic acid water, the lecturer agitated some soda water in a piece of lead pipe, and then proved the presence of lead in the water by adding sulphide of ammonium and obtaining a black precipitate. As an illustration of the immense proportions to which the soda water business has attained in this country, he estimated that no less than a hundred million glasses were consumed annually.

A large number of ingenious varieties of soda water bottles and siphons, together with the apparatus for filling the latter, were exhibited. They had been loaned for the purpose by the manufacturer, Mr. John Matthews. The filling apparatus consists of an iron frame which firmly holds the siphon in place in a favorable position for filling. When the siphon is inserted, the screen is made to slide over it to prevent accidents caused by bursting, and to keep it in plaee; the fountain valve is opened, and the treadle is pressed down with the foot, by which the siphon spout is pressed into the filling head.

Numerous natural mineral waters, renowned for their curative properties, have been analyzed, and are now prepared artificially and charged with carbonic acid gas. A number of them were tested before the audience for various constituents.

Another industrial application of carbonic acid is in the manufacture of aerated bread. In ordinary bread, the yeast produces a fermentation by which carbonic acid is evolved, which gives to bread its spongy character. The same thing is accomplished without yeast by forcing carbonic acid gas under pressure into the dough.

The successful extinction of fires in mines by means of carbonic acid gas has developed a new industry, that of the fire extinguishers, of which the Babcock is the most common. This consists of a portable cylinder, in which a charge of sulphuric acid can, at a moment's notice, be inverted into a quantity of marble dust, and the pressure developed by the resulting gas employed to project a stream of water, in case of fire. There is hardly enough gas present to be of much service as an extinguisher; the advantage of the apparatus lies in its convenience. To show its action, some benzine was poured on the floor of the stage, kindled, and then put out by a stream from a Babcock apparatus.

The lecturer next proceeded to the interesting experiment of liquefying and solidifying carbonic acid. For the purpose of accomplishing this, high pressure and cold are necessary. The pressure was obtained from Ritchie's improved form of Natterer's apparatus, Fig. 3, which stood on the stage, and was driven by steam power derived from the engine in the basement of the Institute. In this apparatus the gas is conducted into a bronze receiver capable of resisting a pressure of 200 atmospheres, and is condensed by means of a steel force pump. The receiver is surrounded by a copper cylinder containing a mixture of ice and salt. When enough of the gas was thus liquefied, it was caused to pass through a tube terminating in a fine rose of wire gauze and into a lined woolen bag. On passing out, the cold produced by evaporation was so intense as to freeze the liquid carbonic acid, which formed a deposit resembling snow; in fact, the lecturer made a little snowball of some of it, and threw it among the audience, with the caution not to allow it to melt in their hands, as it would blister them. Numerous experiments were made with this substance, the most interesting of which was the freezing of mercury in a white hot platinum capsule. Water placed in the latter assumes the spheroidal state, in which it does not really touch the vessel, being separated from it by a layer of steam; if now solid carbonic acid, mixed with ether, is introduced into the water, enough heat is absorbed by the evaporation of the carbonic acid to freeze a small quantity of mercury placed in the mixture.

C. F. K

Wooden Pavements made Successful in London.

After a sufficient comparative trial, the contest between granite, asphalt, and wood for carriage ways has been decided in favor of the last, and the recent conclusion of the Corporation of London may be regarded as a final confirmation of that decision. Mr. Heywood, engineer for the city, has shown that before a horse falls he may be expected to travel on granite 132 miles, on asphalt 191 miles, and on wood 446 miles; and although between the two last materials there is a trifling advantage in the cost on the side of asphalt, that is much more than counterbalanced in other ways. In easy traction and the absence of noise there is no comparison between wood and granite, and since the surface water has been kept out by means of asphalt, wood has become one of the most durable of pavements. The rapidity with which it can be laid and the ease with which it can be repaired are not the least of its merits, while the flooring of planks, which is now laid as a superstructure, gives great elasticity, and, by distributing the weight equally over the whole pavement, adds to its power of endurance.

To Blacken Brass.---To Clarify Shellac Solutions.

The *Bulletin Belge de la Photographie* gives the following as a good and convenient method of blackening brass surfaces for photographic purposes. The metal, having been thoroughly cleaned, is brushed over with a solution of bichloride of platinum, known as chemical bronze. If one or two drops of solution of nitrate of silver be added to $\frac{1}{6}$ of a cubic inch of the platinum solution, its action is considerably augmented. For clarifying solutions of shellac, the same journal recommends the addition, to the varnish it is required to clear, of a quantity of powdered chalk equal to the weight of lac used. After thoroughly mixing, and heating to 60°, the mixture is allow to settle, when three quarters of the bulk may be poured off perfectly clear, or, if necessary, it may be filtered with the greatest ease.

Photo Printing Plates.

M. J. Husnik employs the following formula for the production of engraved plates by means of photography. It is based upon the use of bichromatized gelatin, the necessary grain being given by chloride of calcium. The formula consists of gelatin, 24 parts; bichromate of ammonia, 4 parts; alcohol, 72 parts; chloride of calcium, 4 to 5 parts; water, 240 parts. This is spread upon glass or other suitable support, and, after exposure and washing, is used for the production, by the galvanoplastic method, of a plate, from which the prints are pulled in the usual manner.

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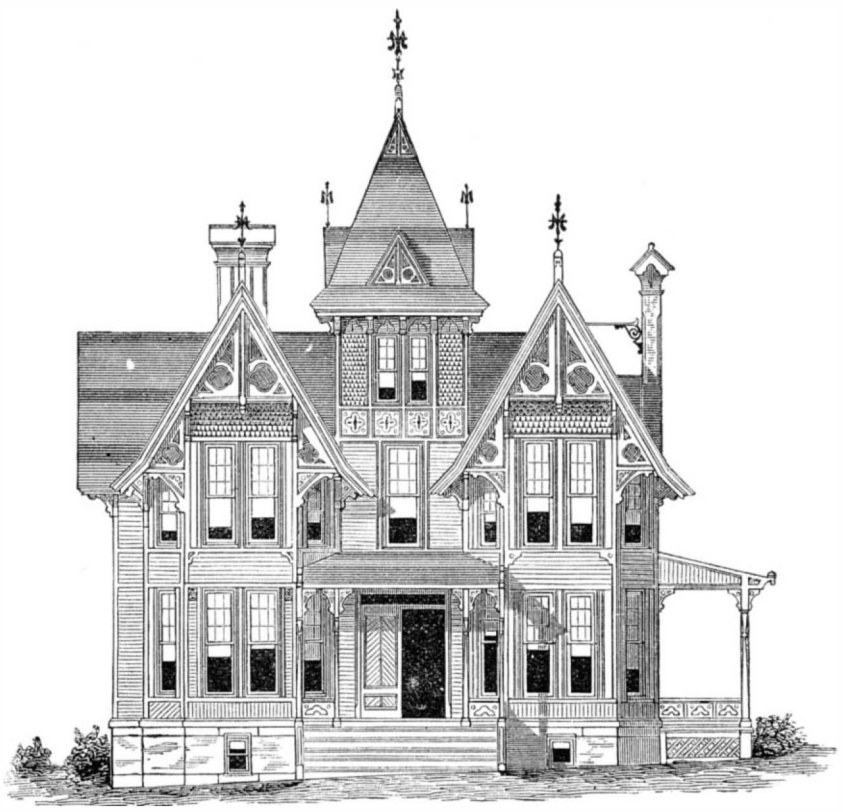
IMPROVED COUNTRY HOMES.

Mr. Woollett, in his book on "Villas and Cottages, or Homes for All," published by A. J. Bicknell & Co., New York city, describes a villa of frame structure designed for erection on a stone foundation, with cellar, with heavy sill, corner posts, girts, and plates, and filled in with brick. The house being intended for a central location between other buildings, on a lot of moderate width, has a nearly symmetrical front. Individuality is given to the detail by using panels and bands, covered with cut shingles in place of clapboards, on rough boarding. The roof is also covered with shingles; and both those of the roof and bands are painted in deeper tints than the main woodwork. The finish of the interior is to be in white ash and butternut. The estimated cost of the house is about $8,000



A MODERN VILLA RESIDENCE.

A New Profession.---A Champion Speller.

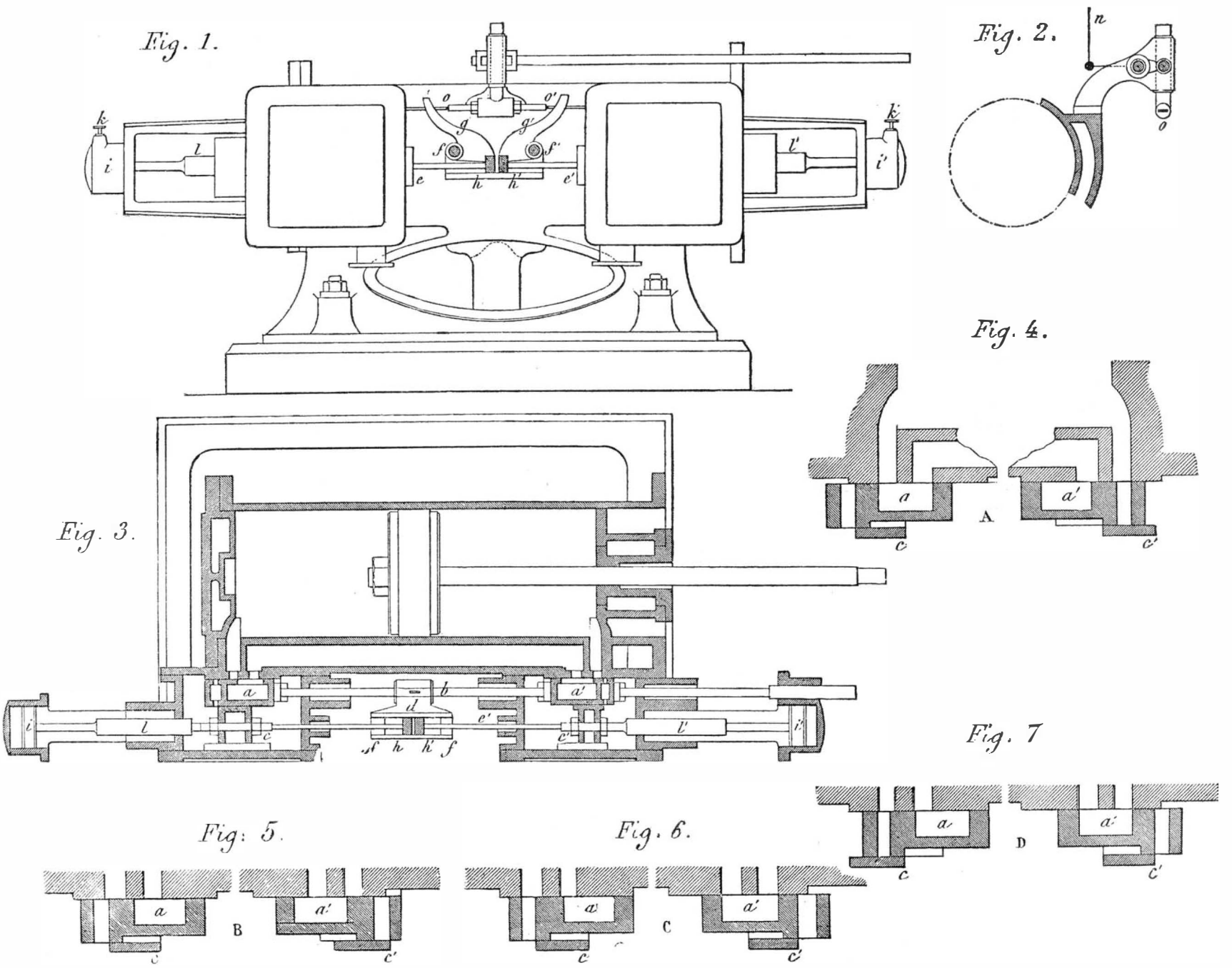
Spelling bees, which went out of fashion here a couple of years ago, have been for several months past the subject of a *furore* in England. Our English cousins have vanquished us fairly in turning these meetings into money-getting affairs. The most we ever made was admission money at the door, and the victors in the match usually proudly bore away a copy of Webster's "Dictionary." In England, however, halls are hired, and large money prizes are offered to the best spellers, the contestants being charged an entry fee similar to that put up by the backers of horses in a race. The managers, of course, find their profit in these deposits. The most curious part of the whole is that the fact of the money awards being offered has given rise to a new business, that of "champion speller." Several people, who have a fair knowledge of orthography to begin with, have literally crammed themselves with dictionary lore, so that they are proof against the pitfalls of ordinary catch words. Thus mentally equipped, they reverse Dr. Watts' hymn, and gather money every day from every opening bee. Their attainments render them easy victors; and one individual, who has reached the pinnacle of the new profession, says that he makes over a hundred dollars a week by his winnings.

NEW CUT-OFF MECHANISM.

We extract from the *Bulletin du Musée* the annexed engravings of a new and simple cut-off mechanism, the invention of M. F. Wannieck, of Brünn. The engine to which it is represented as applied is of the horizontal type. The governor travels at high speed, and its changes are transmitted by a very simple set of levers to a rod which rises and descends in a support attached to the cylinder and carrying on its lower extremities a horizontal cross piece. This disposition is represented in detail in Figs. 1 and 2, in which *o o'* is the cross piece. The higher the elevation of the governor balls, the lower the piece, *o o'*, descends, and *vice versâ*. The two slide valves, *a a'*, are connected by the rod, *b*, and are actuated by an eccentric on the shaft. On said valves move two mutually independent cut-off valves, *c c'*, fixed to two rods, *l l'*, which traverse the valve chests, and pass into stuffing boxes at each side. At one extremity each rod is terminated by a triangular head, *h h'*, while at the other is formed a piston, *i i'*, movable in a finely bored cylinder. The portions of the rods situated at the sides of the pistons, *i i'*, are re-enforced toward *l l'*; so that when the valve chests are filled with steam, an excess of pressure is always produced on the said sections, *l l'*, and so that the valves left to themselves are always pushed outward by the steam in the boxes. The screws, *k k'* (Fig. 1), permit of the regulating, at will, of the outward pressure exercised on the rods, *l l'*, and consequently of the action of the cut-off valves, *c c'*, according as the air is, by the adjustment of the screws, allowed to escape slowly or freely from before the pistons, *i i*. The fact should not be lost sight of, in following the subjoined description, that the two valves, *c c'*, are not immediately connected, but normally are subject to an outwardly pushing pressure.

On the middle of the valve rod, *b*, is secured a crosshead, *d* (Fig. 3) which surrounds the extremities of the cut-off valve rods so as to serve as a guide for the two rectangular ends, *h h'*. This crosshead carries two pawls, *g g'*, which turn around axes, *f f'*, and which, through their gravity, tend always to fall, as shown in Fig. 1. These pawls, in the forward part of their lower extremity, have notches in which the rectangular heads, *h h'*, engage, so that the rod, *b* (Fig. 3), is pushed toward the right or left, according as it engages one of the other of the cut-off valve rods. The pawl then falls on the head of the rod, and draws the latter in the return movement of the rod, *b*. We may remark here, in order to prevent misunderstanding, that in Figs. 1 and 3 the heads, *h h'*, of the cut-off valve rods are placed in a median position and represented as both engaged with the pawls, a condition which never can occur while the engine is in operation.

We will consider first the forward motion of the engine during a stroke, and suppose the return movement of the piston to take place from left to right. In such case, it is clear that the rod, *b* (Fig. 3), with its two valves, *a a'*, will have already been pushed toward the left by the eccentric up to the point where the left hand valve, *a*, establishes communication with the exhaust, as indicated in Fig. 4: which also shows the extreme position of the valve and the point to which the pawl, *g*, of the crosshead, *d*, has been carried (to the left) in order to engage the head, *h*. During the return movement, the valve, *a*, moves from left to right, and at the same time carries the left cut-off valve, *c*, attached to it by the pawl, *g*, while the right cut-off valve, *c'*, which has not been engaged by a



WANNIECK'S CUT-OFF MECHANISM.

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pawl, remains at rest in extreme position to the right, Fig. 5. Fig. 6 shows the steam port still more open; the right valve, a', establishes communication with the condenser, and the corresponding cut-off valve, c', is in repose. In the position which occurs immediately after (Fig. 7), the upper curved arm of the pawl, g, impinges upon the left hand extremity of the horizontal piece, $o\ o'$, and the left cut-off valve is freed and returned to its extreme left hand position. The rod, b, continuing its advance, the pawl, g', operates in turn exactly like the pawl, g, so that one or the other of the pair is continually in play.

The general arrangement is quite simple and certain in action. When sudden variations occur in the work, the piece which carries the traverses, $o\ o'$, lifts or lowers instantly, and the action of the pawls is accelerated or slackened, so that, in the first case, the admission of steam is interrupted sooner, and, in the second case, it continues longer. The mechanism, as a whole, is reported to be remarkably sensitive.

Correspondence.

Steam Domes.

To the Editor of the Scientific American:

That steam boilers of all kinds would be cheaper, safer, and more durable without domes, there can be no question. The question is: Can steam be supplied to the cylinders, drier and cheaper, from the top of a dome, than from a perforated pipe, placed inside and close up to the crown sheet of the boiler? The perforations, of course, are to be made in the upper side, and nearly the whole length of the pipe, which extends the whole length of the boiler. Engineers who have run locomotives, both with and without domes, for from 10 to 25 years, say that they can see no practical advantage in the dome; and some of them hold that an engine is less liable to prime or throw water into the cylinders with a perforated pipe than with a dome with the throttle valve and steam pipe arranged in the usual way: for the reason that the aggregate area of the perforations far exceeds the capacity or area of the cross section of the steam pipe. Consequently, when the engine is at work, there is no rush or tendency of steam to a special point, as in case of the dome; the perforations can be made so plentifully as to exceed five or ten fold, if necessary, the capacity of pipe to conduct off the steam, the throttle valve being placed in the smoke arch end of the pipe.

The Boston and Albany company have been building the no-dome type of locomotive many years in their shops in Springfield, and are still at it. Mr. Eddy, their indefatigable machinist, tells me that their first engine of this type was put on the road in April, 1851, and that this engine is still at work with the same boiler, with the exception of the fire box. Since that time he has been constantly building precisely this style of engine for the company, in connection with their extensive repairs, till now, of the 246 locomotives belonging to the company, a large portion are of the no-dome type. Surely, such an experiment, which has been so persistently and successfully carried out for a term of 25 years, ought to have some weight in deciding the dome question.

F. G. WOODWARD.

Worcester, Mass.

The Vicksburgh Cut-off.

To the Editor of the Scientific American:

On page 329 of your current volume, under the title of "The Vicksburgh Cut-Off," there appear some singular errors. One is that, the Mississippi river makes its way under the bluff of Vicksburgh by sharp deflections, east and west, nearly fifty miles from its direct course; and that boats pass up and down through the cut-off, avoiding the *détour* to Vicksburgh, thus saving about thirty miles of navigation.

As regards the first: The only immediate deflection is above Vicksburgh, from the bend below Young's Point, to the bluff of Vicksburgh, and it is about six miles in length; for the river, after leaving Vicksburgh, runs direct to Hard Times, and nearly so to Natchez. As for the second: The cut-off is only about five miles from Vicksburgh, and the saving of distance to boats would not exceed ten miles at the furthest; and it would make no interference with the trade or business of Vicksburgh, which will always be of importance, being on the first bluff of moment below Memphis.

When in command upon the Mississippi river, I urged the fortification of Vicksburgh and Port Hudson, and commenced work upon the former in September, 1861, but was stopped by order from Richmond. General Grant's attempt at a cut-off was only abandoned after an immense amount of labor; and the canal filled up from deposit, instead of the river working through, which showed the error arising from ignorance of the laws governing the river. But had he succeeded in making the cut-off, the operation would have been equally a failure in a military point of view.

New York city. C. G. DAHLGREN, of Mississippi.

Do Bees Make Honey?

To the Editor of the Scientific American:

Is it not astonishing to find that professors at this day state that bees make honey? A good common stand of bees, having but short distance to travel, will increase their stock of honey from 1 to 2 lbs. in 12 hours fair work. What chance is there here for a digestive process? Place 3 lbs. loaf sugar sirup within easy reach of such a stand at 8 o'clock P.M.; it will all be taken up and stored away before sunrise next morning. I once thus experimented; After feeding, to about 40 hives, 9 barrels of Cuba honey, upon examination I found no difference between that in the comb cells and that in the barrels, only the former was clearer from dirt. The honey becoming exhausted, I then fed the bees during the rest of the fall season with loaf sugar sirup. Upon examination next spring, I found the comb cells filled solidly with well grained loaf sugar, precisely like that I had dissolved to feed the bees with. Other comb cells were partly filled with Cuba honey and partly with ground loaf sugar.

South Union, Ky. H. L. EADES.

The Grasshopper Pest.

To the Editor of the Scientific American;

In your issue of May 20, I notice some statements from the Minnesota State Commission and Professor Riley, in regard to grasshoppers, from which I beg leave to differ. As I have had experience with the pests during two visitations in Kansas, in the years 1867–8 and 1874–5, I think I have a right to a hearing.

As to the sack which contains the eggs being affected by moisture, I will quote an instance. In the fall of 1867, the grasshoppers deposited eggs on a dry slough on the Missouri river; early in the spring the place was overflowed, and remained under water till late in the summer of 1868, when it dried up; and the young hoppers came out just as lively and able-bodied as if they had been hatched under the most favorable circumstances. As to their being affected by freezing (as I have seen stated at different times), in the winters of 1874–5 the mercury ranged as low as 28° below zero, and the ground was frozen to the depth of 2½ feet. But the young hopper came out as gaily and festively as if he had laid in a greenhouse all winter, though the eggs did not average an inch under ground.

With all deference for such high authorities as Professor Riley and the Minnesota State Commission, these are facts, as hundreds can testify who have studied entomology in the school of sad experience. If all crops, when sown, were as sure of a bountiful harvest as grasshopper eggs, Kansas aid societies would soon be out of business.

Louisiana, Mo. J. F. DUNWOODY

[For the Scientific American.]

THE CORPUSCULAR AND UNDULATORY THEORIES OF LIGHT---THE EXPERIMENTS OF CROOKES AND PLEASONTON.

One of the brightest luminaries of the scientific firmament in the seventeenth century was a believer in the corpuscular theory of light. Sir Isaac Newton thought that the sun sent out from its surface fine particles of some kind of matter, which flew with immense velocity against the retina of the eye and produced the sensation known as light and vision. The succeeding age substituted for this improbable theory another, namely, that light is due to vibrations in an extremely thin ether which pervades all space. So many phenomena have been explained by this latter theory, especially those in regard to the interference of light, the diffraction spectrum, and Newton's rings, that the undulatory theory, notwithstanding the difficulty of conceiving of an all-pervading ether, imponderable and disobeying most of the laws of matter, has been accepted as a truth. Nay, more; the length of each wave of light has been measured, as well as those of heat and actinism.

Some recent discoveries have led certain gentlemen to revive the long abandoned corpuscular theory; and of these we may mention two only, William Crookes, the discoverer of thallium and of psychic force, and General A. J. Pleasonton, of blue glass fame. The former is already known to our readers, not only by his contributions to spiritualism, but by his last invention, the radiometer. The latter, illustrated in the SCIENTIFIC AMERICAN, p. 392, volume XXXII., he supposed to be set in motion by the impact of flying particles of light. Another physicist, however, tried the effect of floating this pretty toy in water, and found that then the arms stood still and the glass envelope revolved in an opposite direction, indicating that the motion was due to a mutual repulsion between the arms of the apparatus and the glass. This is most readily explained by supposing that the molecules of extremely rare air in the envelope are in rapid vibration, for this is supposed to be true of all gases, and that the effect of the light, or rather the heat attending it, increases this motion of the molecules, and thus either drives the arms in one direction or the glass in the opposite.

General Pleasonton published a little blue pamphlet in 1871, printed with blue ink on blue paper, and bound in a blue cover, to inform the world how much better blue light is for plants and animals, and how the sick, the insane, and those who have the blues could be cured by "getting blue" by his process. Recently our military blue bird has again brought his theories before the public, chiefly through the columns of a daily paper, and boldly attempt to overthrow not only the undulatory theory of light, but the laws of gravitation and many other accepted dogmas. His theory, as briefly stated, is that the particles of light moving through space generate frictional electricity, which in turn produces magnetism and heat. The sun, planets, and other heavenly bodies are magnets, a fact known to be true as regards our earth, at least.

It is interesting to note a few of his curious arguments and their flimsy nature. For the attraction of gravitation, which varies as the square of the distance, he would substitute magnetism, which diminishes as the cube of the distance, and which will not only attract but repel, a phenomenon not observed among the heavenly bodies. Magnetism falls so far short of filling the *rôle* of gravitation that the sooner General Pleasonton abandons this theory, or modifies it to suit the facts, the better,

The sun sends us light, but no heat: the heat which we seem to obtain from him being due to the friction produced by the particles of light passing through our atmosphere. "The sun, in its daily course, being above the earth, if it had any calorific rays, could not send them to the earth below it." Why? Because, in our rooms, a stove does not throw its heat down towards the floor, but only upward. When this philosopher used the term up and down as regards the relative position of sun and earth, we at first took it for pleasantry; but he seems to be in dead earnest, for he gives several illustrations of the tendency of heat to ascend. Among others, he states that a thermometer stood at 12° on the floor, 10 feet from a red hot stove, in a room used as a meteorological station on Mount Washington.

"Blue glass produces heat" is another of his assertions, based on the fact that, on a bright day in March, the temperature of his grapery (a portion of the glass being blue) was 110° Fah., while the temperature out of doors was 76° lower. This difference of temperature he attributes to the few panes of blue glass alternating with clear ones, and he believes blue glass to be a good substitute for stoves! We wonder if every florist has not observed a similar production of heat by the use of clear glass; and why do hotbeds possess such advantages, except that they act as traps for the sunbeams, allowing heat to enter and preventing its escape? The abundant ignorance of well known facts and long established laws is surprising in one who attempts to overthrow the laws of Newton, and make fearful onslaught on Tyndall.

Because Pleasonton attempts to build a wild, fantastic structure on the corpuscular theory, and because Crookes' radiometer admits of explanation on the undulatory hypothesis, are not conclusive reasons why Newton's theory of light was wrong, or ours is right; but, gentlemen, we want some better proof.

E. J. H.

New York city.

A Railway Train Lifted by the Wind.

The St. Louis and New Orleans express train was struck by a tornado soon after passing Neoga, Ill., at 5:15 P. M., May 6, 1876. Mr. W. K. Ackerman, General Auditor of the road, who was on the train, says that he first saw the smoke stack of the locomotive sailing off through the air. "The next instant the whole train was lifted on one side: and though moving at the speed of 25 miles per hour, the cars ran some distance on the left hand trucks, the right hand trucks being lifted into the air. Then, with a terrible shock, the cars went over to the eastward, falling clear of the track, and stopping almost instantly on striking the ground. The whole damage was done so instantaneously that no one had time to prepare for the crash, nor could it possibly have been avoided."

The passengers and employees were badly bruised, but only one, a brakeman, was dangerously injured. Mr. Ackerman had his right collar bone and left shoulder blade broken, and his wife was also badly bruised. The cars fell on the east side of the track and lay on their sides perfectly clear of it; the engine, weighing 35 tuns, was partly displaced, though the front trucks remained on the tracks. The cars were somewhat wrecked, but not badly, most of the trucks remaining on; the track was hardly injured at all, showing how clean had been the lift which took the cars off.

PRACTICAL MECHANISM.

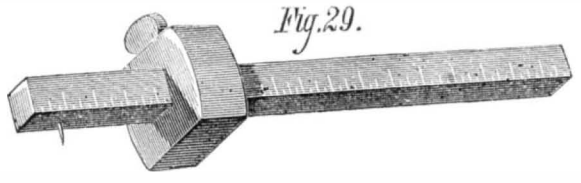
BY JOSHUA ROSE.

SECOND SERIES—Number V.

PATTERN MAKING.

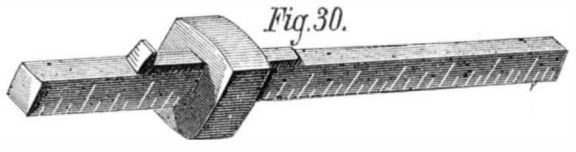
Of gages for drawing marking lines at any regulated distance from the finished edge or edges of the work, there are several kinds; first we have that shown in Fig. 29, which is

Fig. 29.



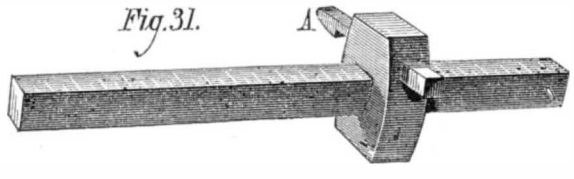
the kind ordinarily sold; others have, instead of the set screw, a wedge running lengthwise, as shown in Fig. 30. A

Fig. 30.



better gage, however, than either of these is that shown in Fig. 31, in which A represents the tightening wedge, standing at a right angle to the rod of the gage. The advantage of this design is that it requires only one hand to work it,

Fig. 31. A



inasmuch as the wedge may be loosened or tightened by striking it, as if it were a hammer, against anything that may happen to lay on the bench. Thus the gage may be set and adjusted with one hand, while the other is holding the work, as is often necessary when marking small work. The

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marking point should be a piece of steel wire fitted tightly in the stem, the protruding part being ground or filed to a wedge, with the two facets slightly rounding, and whose broad faces stand at a right angle to the stem of the gage, the point or edge only projecting, sufficiently to produce a line clear enough to work by, otherwise it will not be suitable for accurate work. The mortise gage is similar to the above as regards the stem and sliding piece, but it is provided with two marking points, their distance apart being adjustable. Fig. 32 represents the gage referred to, the head screw working in brass nuts. On account of the narrowness

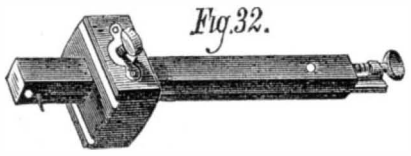
Fig. 32.

of the base afforded by the sliding piece on the common gage, there is not sufficient steadiness to gage to any great width, so that for widths above ten or eleven inches we must have recourse to the gage shown in Fig. 33. It is called the

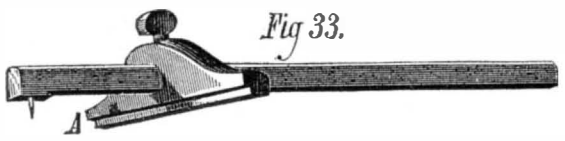

Fig. 33.

panel gage; its sliding piece may be seven inches long and the stem two feet; the rabbeting at A forms a steadying base, the part of the rod about the marking point being raised to correspond with the distance from the rabbet to the stem nut. Next we have the cutting gage, shown in Fig. 34, in which a

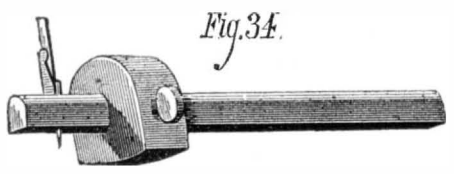
Fig. 34.

steel cutter takes the place of the marking point, being wedged in position. It is employed to cut thin strips of wood, that is to say, of thicknesses up to about a quarter of an inch. The cutter point should be tempered to a dark straw color.

For marking off curves or large circles, we require a pair of beam compasses or trammels, as shown in Fig. 35. They

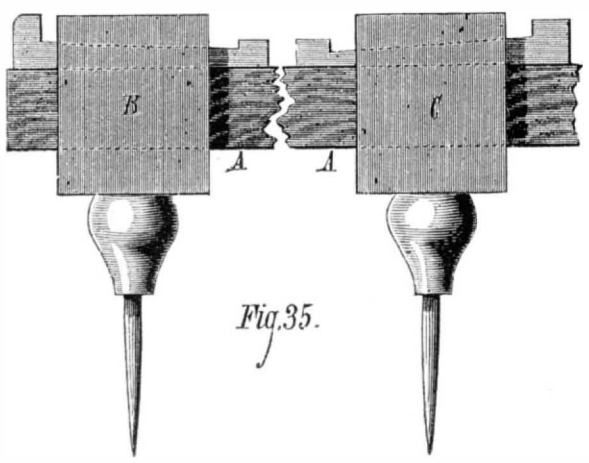

Fig. 35.

are composed of two sliding sockets made of either wood or metal, fitted, at a sliding fit, to a staff. They are made of various designs to suit the taste of the maker, and are often made by the patternmaker himself during his term of probation; the style shown in Fig. 35 is one very easily made. A A represents a staff of any desired length, composed of common pine. B and C are the two sliding sockets or holders; the mortises in them are made to fit the thickness of the staff, but they are longer than they are wide, to admit of the fastening wedge. They may be made of some hard wood,

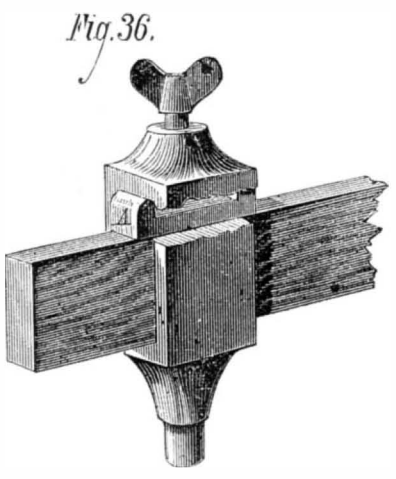
Fig. 36.

such as maple. The lower parts being turned and fitted with brass ferrules, a small hole is then drilled up the turned end of each, into which bradawls of large size are driven; they are then pointed on a grindstone. The wedges are made with a gib head on the small end so as to prevent them from flying out when tapped back to loosen the sliding sockets from the staff for adjustment. If maple be used for the sockets, then the wedges may be made of a dark colored wood, sandpapered and varnished two or three times, which will give them a neat appearance. Made as above described, the trammels will be light and almost everlasting; and as the materials are always at hand, the cost is a minimum.

In place of the wedge, a screw may be and sometimes is used, in which case a packing piece of either wood or sheet brass should be inserted, as shown in Fig. 36, at A, which will protect the staff from being indented by the end of the screw when the latter is tightened up.

Our next requirement is the straight edge which, for small work, is better of steel than of wood. A straight edge is a piece of stuff whose edges are straight and parallel to each other, which is necessary because they are sometimes used in conjunction with the square. A pair of straight edges, termed winding strips, are indispensable; their use is shown in Fig. 37, in which A is a piece of work requiring to have its edge

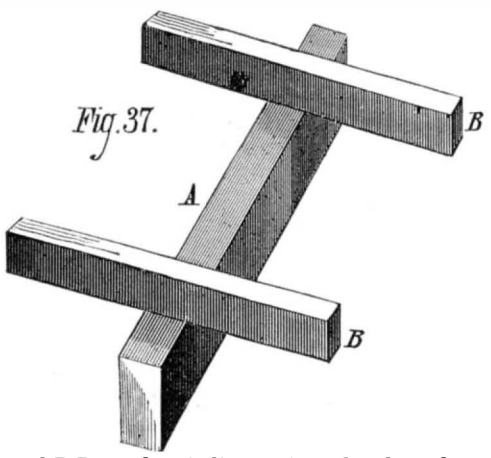

Fig. 37.

true, and B B are the winding strips, placed on the work as shown, so that by casting the eye along the upper edge of one strip, and leveling the head so that the edge of one strip will will be brought nearly horizontally level with the other, it will readily be perceived whether the two are level one with the other, and hence whether the face of the work is true. Winding strips are simply pieces of wood made parallel and true, and generally about two feet long, three or four inches wide, and about five eighths of an inch thick. When the edges have been made as straight as possible with the truing plane, one of these should be lightly chalked on its edge face and laid upon the other, and then moved back and forth through a distance of about one half inch. The upper one should not be pressed to the lower but allowed to lie of its own weight, otherwise it will spring to suit the outline of the lower one, or bear upon it at the points pressed by the hands. Before separating the two, take a blacklead pencil and make a mark on one side of each, so as always to be able to bring the pieces together in the same way. Then separate them and ease away the high places, continuing the truing operation until they bear all over. In placing them upon the work, be careful that they stand parallel to each other, that is to say, that the distance between them is about the same at each end, otherwise the eye will be misled in sighting them when on the work.

In Fig. 38, we have an ordinary screwdriver, the point of which should be shaped as shown at A, in Fig. 39, and not as shown at B, as is usually the case, because if the part entering the screw head is tapered, it not only raises a burr on the screw head, but it is liable to slip out, even from a screw that drives easily, and much more from one that drives hard. To grind it to the shape shown at A, it should be ground on that side of the stone in which the latter is running toward you, the length of the screwdriver being at a right angle to the plane of the stone, and the handle held in one hand, while the driving end is held in the other which should be supported by the grindstone rest. If the stone is a small one, the screwdriver, while being ground in this position, should be moved a little, so that first one corner and then the other will approach the stone, so as to prevent the grinding from being hollow, which would weaken the screwdriver point by thinning it in the middle. Screwdrivers should be made of cast steel, and tempered at the point to a blue color.

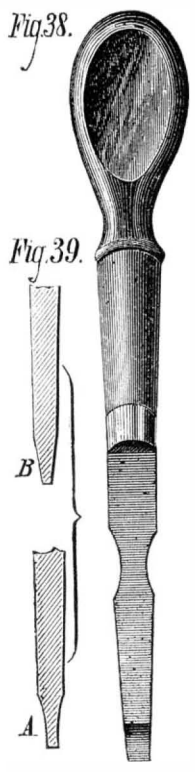

Fig. 38.
Fig. 39.

The mallets should be of hickory and of the form shown in Fig. 40, the sizes being, one 2½x3x5 inches long, and another about 3x3½x5½ inches long, the handles being mortised and properly wedged to the head.

Of oilstones there should properly be two, one for roughing and one for finishing. Wichita or Arkansas stones are even in grain and cut well, and are the best for our purpose. In addition to the large oilstone, a number of slips of oilstone are necessary, some being flat, others half round and flat, with round edges, their uses being for gouges and other tools in which the cutting edges are hollow or curved. The general oilstone should be kept with a flat face, otherwise it will be impossible to properly set plane blades, firmer and paring chisels, and other similar tools upon it. With this object in view, the workman should set small tools upon the ends, so as to prevent the stone from becoming hollow in the middle. When it becomes necessary to grind the face of the oilstone, it may be done upon the grindstone, but a better plan is to take a flat board and liberally supply it with clean sand and water, and then grind the oilstone on it by hand, leaving the face a little rounding in its length by easing it off at each end, but leaving it flat across the face, by which means it will last longer without regrinding. There are some stones which are used with water instead of oil; they do not cut, as a rule, very freely, but the finer grades of them will cut unusually smooth; these are the descriptions used by the Japanese workmen, who use two stones, one to rough cut, which cuts very freely, the other to finish, which seems to grip the metal firmly, rendering it easy to keep the tool at the necessary angle and level, while at the same time it cuts very finely indeed. The first is a bright yellow stone, the latter is of a green slate color, hot water being used on both

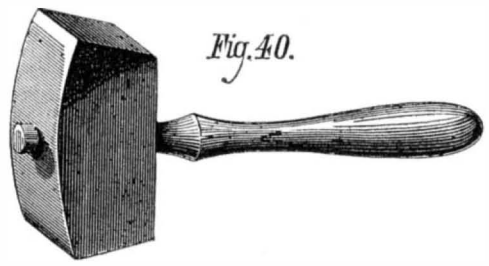
Fig. 40.

of them. Aside from those already mentioned, we have the Turkey stone, a close grained and amber-colored stone, which cuts freely or fine, according to the grade of the stone. For all ordinary purposes the Arkansas stone will suffice, and it is obtainable at almost every hardware store. The oilstone for general use should be fitted into a block of wood, having a margin outside of the stone of one half inch on each side, and about an inch at each end, the block being hollowed on the bottom face so that it will stand firmly and not rock when in use. It should also be provided with a cover to prevent dust and dirt from accumulating upon it.

Two pairs of inside and three pairs of outside callipers are necessary to the pattern maker, the smallest of each pair being large enough to take in diameter up to four inches, the largest from four up to about ten inches. The other pair of outside callipers may be large enough to use upon diameters from ten to eighteen inches. For bores above ten inches a wire gage may be used, by bending a piece of wire as shown in Fig. 41, which may be shortened by being bent more, or lengthened by being straightened. It is preferable to make an adjustable gage, such as shown in Fig. 42, in which A and B represent two sliding pieces of steel, and C and D screws and nuts. It is obvious that, when the screws are loosened sufficiently to just let the sliding pieces move by a slight tap, the gage may be extended by striking the ends, E, or either of them, their inside edges being rounded off to prevent them from burring. It is better to set them at first a little below the required size, and to perform the adjustment by opening them, so as not to require to strike the point at all. The points should, however, in any event be tem-

Fig. 41.

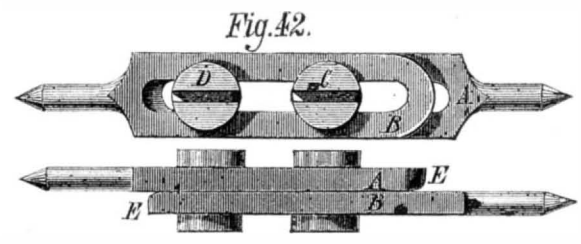

Fig. 42.

pered to a blue. It is an excellent plan to file away the screw heads on two sides, a little, say 1/32 inch, thus forming a sliding piece under each head to fit into the slot of the gage, which will prevent the screws from turning when screwed or unscrewed, and in the end save much annoyance. A small machinist's square and a steel rule are also necessary for small fine work, the wooden ones being too clumsy; the edges of the rule should be trued so that it may be used as a straight edge.

Photo Printing Bath.

M. D. Ratti, in the *Revista Fotographia*, gives the following as an economical printing bath, producing excellent results: Nitrate of silver, 40 parts; nitrate of ammonia, 40 parts; white sugar, 40 parts; water, 1,000 parts. The best description of paper to use with this solution is one very lightly salted, about 2 parts of salt to 1,000 of albumen being the strength mentioned by the author; the toning and subsequent operations are the same as those in general use. After the solution has been once used, it is shaken up with ten drops of washed animal charcoal, which is allowed to remain in the bottle in order to keep it colorless. It is strengthened from time to time by the addition of a due quantity of similar solution, but containing two and a half times the proportion of silver.

How to Disinfect Carriages.

The best method of disinfecting carriages is to burn one ounce of sulphur inside the carriage, the doors and windows being closely shut, and the loose cushions stood on end. The clothes should be disinfected with sulphurous acid, as in the last case; except that, if the sulphur be burnt in an ordinary room, about four ounces of sulphur should be used; but if possible, the clothes should be placed in a chamber of small size, or large box, heated by gas or fire, and exposed to a temperature of from 230° to 250° Fah. as well as to sulphur fumes. Exposure to heat will do, with or without the addition of sulphur. Of course nothing that will bleach must be exposed to sulphurous acid gas, unless the owners are first told that the color of the article will probably be destroyed.

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IMPROVED CARVING AND PANELING MACHINE.

There seems to be a growing demand among workers in wood for machinery which will effect a decrease in the waste of the raw material corresponding to its advancing cost, and enable them to utilize new methods of designing and working in wood in such a manner as further to lessen the expense of production.

Among these new methods is that of paneling or carving moldings in the solid wood, instead of producing them separately and then attaching them to the article being made For this purpose special machines are being constructed.

The accompanying illustration is from a machine recently brought out by J. A. Fay & Co., Cincinnati, Ohio. It is designed to produce carvings and recessed or relieved panels on the surface of lumber, also for edge molding and ornamenting the edges of bracket and fret work, etc., in a rapid and perfect manner. It is especially adapted for furniture, coffin, piano, and organ manufacturers, etc.

The machine is constructed on a hollow iron column of a form to best meet the requirements of the working parts, the neck being extended to support the cutter spindle over the center of the table. The table is adjusted to the proper hight, and regulated, to form the desired depth of molding or carving, by a hand wheel and screw. It has a sufficient movement to allow stuff four inches thick and under to be worked. The elevation of the table to bring the material in contact with the cutter is accomplished by a notched treadle, and its depression, in order to remove the stuff, by an auxiliary treadle, which disengages a pawl, allowing the table to fall to its original position.

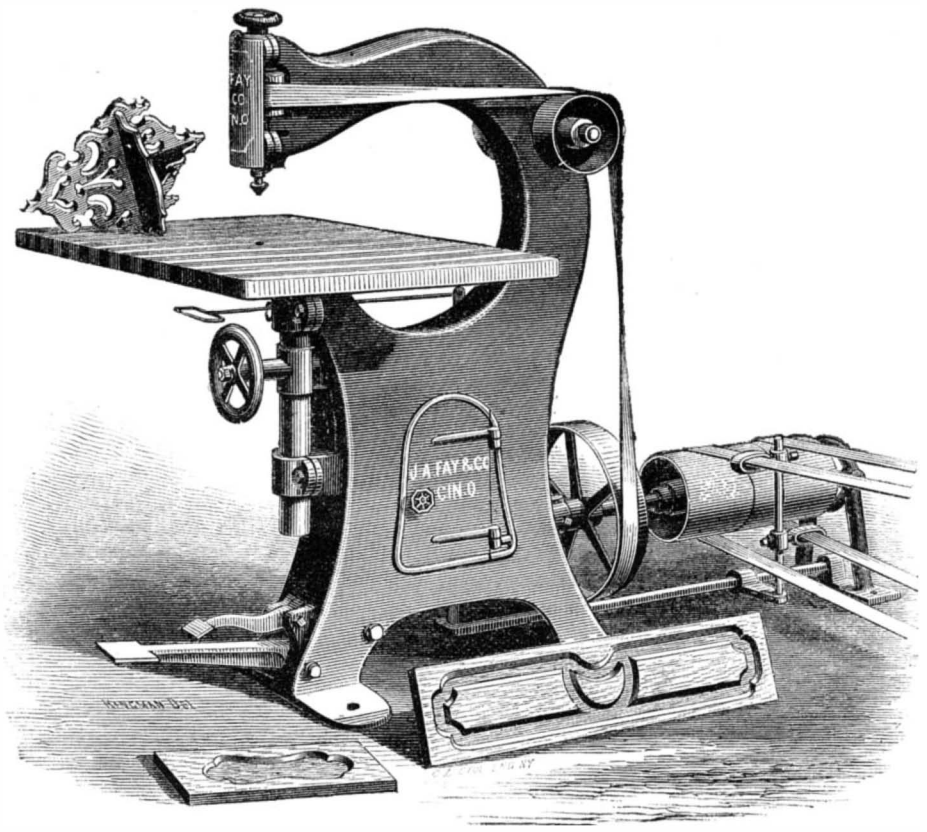
The cutter is reversible in its motion, and is placed in a tapered split sleeve extending through the spindle and fastened or released by a hand wheel at the top. The reversible motion of the cutter is produced by the method of belting with a cross and straight belt, alternately shifting from a loose to the tight pulley as the nature of the work may require. The handle of the reversing lever is under the table, within easy reach of the operator, and is provided with stops to retain it in proper position.

In the operation of carving, the pattern is placed over the piece to be worked, and guided by a fixed collar attached to the spindle, or a loose collar on the shank of the cutter. Any diameter of cutter can be used without altering the size of the guide collar. There being an opening between the pattern and the piece being carved, the cutter and its working are at all times in plain view of the operator.

Attached to the spindle is a fan blower, which removes all dust in the contrary direction from the operator, and keeps the surface of the work free from obstruction. The points claimed for the machine are that it is convenient, efficient, and durable, and that its comparatively low cost places it within reach of all who are in want of such a machine.

This labor-saving machine can be seen by any of our readers in daily operation at J. A. Fay & Co.'s display at the Centennial Exposition, columns 61, 62, 63, Machinery Hall, and is not least among their very attractive exhibition.

Further particulars can be obtained from the manufacturers, as above, who, we are informed, have, in addition to their already large list of premiums, been awarded medals at the late Chilian International Exposition, for superiority of their machines over others of the class exhibited.

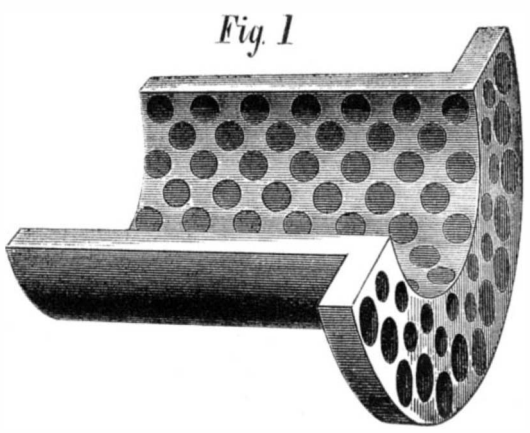


J. A. FAY & CO.'S CARVING AND PANELING MACHINE.

SOME NEW APPLICATIONS OF METALINE.

In the SCIENTIFIC AMERICAN for January 10, 1874, we published a description of the material known as metaline, intended as a substitute for lubricating oil in machinery. Reference to that article will show how the substance is prepared. It will suffice here to say that it is a solid, resembling plumbago, but not necessarily containing the same, and is composed of a large number of ingredients of widely differing natures. It is molded in the form of small plugs, of some quarter of an inch in diameter, which are inserted in shallow cavities made in the inner surface of the box or bearing.

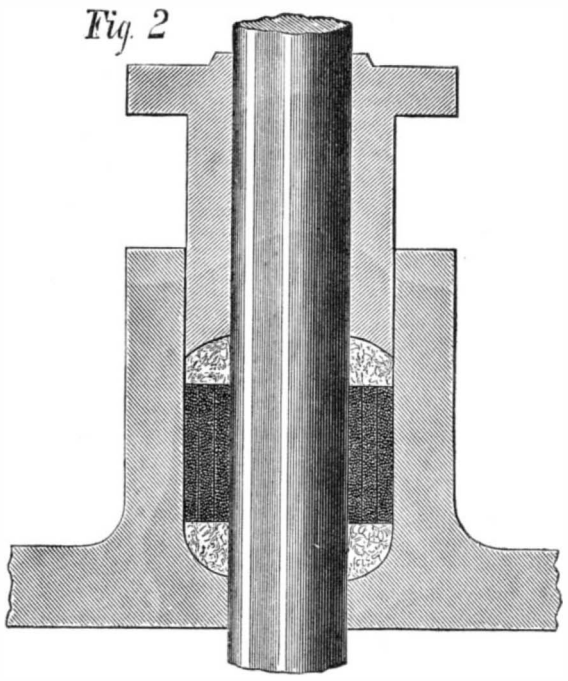
Fig. 1



Since the period of our previous article, the manufacturers have carried on extended experiments into the nature and adaptations of the preparation, and at the same time have made considerable progress in successfully introducing it into several large establishments, notably into the woolen mills of Messrs. A. T. Stewart & Co., the sugar refinery of Messrs. Matthiessen & Wiechers, in Jersey City, and in various other localities where, we are informed, the conditions were such as to severely test its efficacy. Two new results of the experimental investigations above alluded to, we illustrate in the annexed engravings.

The first application, Fig. 1, is to loose pulleys, which, as every mechanic is aware, are extremely difficult to keep lubricated with oil, and equally difficult to keep clean. The manufacturers now prepare linings or flanged bushes, of the form shown, of gun metal, and insert the metaline plugs of the proper size and at correct distances apart. It remains simply to fit the halves of the bushes into the pulley; and this is easily done by any machinist, without disturbing his line shafting. We have examined loose pulleys thus prepared, and can state that such as we have seen run smoothly and without heating. From testimonials exhibited to us, it further appears that, according to the opinion of actual users, the wear is practically imperceptible.

Fig. 2



The second new application of metaline, illustrated in Fig. 2, is its employment as a packing, or, more correctly, as a lubricant and packing combined. This is prepared by spreading metaline in a pulverized state upon strips of crash, and joining the latter in ribbons of from half an inch to eight inches in width. A few turns of braided hemp or cotton packing are first driven into the stuffing box. Above this comes the metaline packing, which is wound about the piston rod, and finally another layer of hemp packing is added before inserting the gland. The metaline packing is claimed greatly to outlast ordinary packing, besides possessing the lubricating advantages of the metaline alone.

For cotton spindles, a new mode of applying the material has been devised, which consists in simply inserting a tube of solid metaline in the bolster and step, the bottom of the spindle being allowed to run in a metaline plug. This adaptation, we are informed, has proved very successful, and in cotton factories, where the use of oil constantly invites conflagrations, the invention will doubtless be found of considerable value.

For our part, we question whether metaline or any other like substance will ever displace oil for all kinds of machinery, and the efficacy of the aforesaid material on railroads yet remains to be proved. There is no doubt, however, tha there are a variety of circumstances under which the use o oil is objectionable, sometimes dangerous, and always costly. It is but fair to state that, in many such cases, as well as in others of general occurrence, where the work is moderate, the results of employing metaline are such as to give every promise of its widely extended substitution for liquid lubricants.

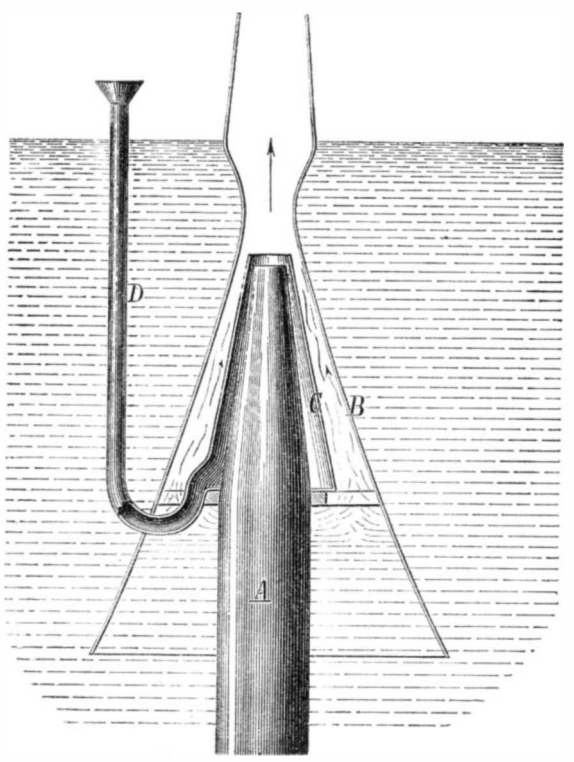
For further information, address the American Metaline Company, 61 Warren street, New York city.

AN ECONOMIC FOUNTAIN.

We are indebted to Mr. Etienne Gillet, of 13 Barclay street, this city, for information concerning a new and very ingenious method of augmenting the jets of fountains, devised by M. Turrettini, of Lyons, France. The principle of the invention is the same as that on which the Giffard injector is based, and will be understood from the accompanying engraving. A is the service pipe, having a narrow end, from which a small jet is forcibly discharged into the enveloping tube, B. The effect is to draw the water already in the basin into the flaring lower portion of tube, B, and to cause it to mingle with and so augment the jet. A large stream is thus obtained by a comparatively small expenditure of water, that in the basin being of course used over and over again. In order still further to increase the size as well as beauty of the fountain, the inventor adds an intermediate envelope, C, between A and B. The effect of the water jet passing through this is to draw in air through the pipe, D, which, mingling with the water, tends to convert it into a mass of spray. The latter, being lighter than water alone, volumes being equal, is accordingly projected to a higher elevation.

Apart from the superior elegance of the fountains thus obtained, we are informed that an economy of about three fifths the water otherwise employed is realized. This has been proved by tests on the city fountains at Geneva, Switzerland; and in Lyons, France, the engineer in charge of the water works of that city states that, while on a fountain without the apparatus 33 cubic feet of water was used in one minute and twenty-two seconds, with it, the same supply lasted two minutes and five seconds.

Mr. Gillet has brought the invention to the notice of the officials in this city, with a view to its adoption in the fountains in our public parks. Fountains just now, however, in New York are something of a luxury. The supply of water is far below the needs of the city; and we have learned to view with some complacency the empty basins and dried-up spouts of a very elaborate and costly but not very artistic granite fountain, opposite our office, knowing that, did the possible columns of glistening spray greet our eyes, there would be a waste hardly to be excused. M. Turrettini's device (if there be sufficient head of water, and we doubt if there is, in most of our parks) may possibly give us back our fountains. At all events it will be found, we think, an excellent and economical invention for cities which, unlike this metropolis, do not squander on a hideously ugly and outrageously constructed court house nearly as much money as would suffice to render the water supply ample for the requirements of the city, both for the use of its million population and the ornamentation of its parks and public squares.



WATERPROOF VARNISH FOR PAPER, ETC., is obtained by precipitating a solution of tallow or resin soap by aluminum, iron or copper sulphate, and dissolving the precipitate in a iquid hydrocarbon, or in carbon bisulphid e

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NEW WINTER-FLOWERING IRIS

This, when seen peeping through the ground in winter or early spring, reminds one of the common netted iris (*i. reticulata*); but its growth is rather taller, and the fall petals are broader and more conspicuously spotted, or rather blotched. Its color is a rich bluish purple, flushed towards the base of the petals with rose pink, the markings being of the deepest purple relieved by a medial ridge or crest of gold in the center of the three external perianth segments. Its leaves are, like those of the netted iris, four-angled; and like that beautiful plant, this also belongs to the bulbous group. When seen pushing through the earth at Kew, England, in the winter of 1874, there was a little patch of snow beside the flower, and nothing could have set it off to better advantage than this, and a tuft of the vivid green *poa annua*, with which it was also associated. This iris is described as a native of Mount Lebanon and also of Mount Gerizim; it was sent to Kew by M. Berberey, of La Ferriere, near Geneva, in March, 1873, who describes it as nearly related to *i. reticulata*, from which it differs not only in structural character, but in flowering six weeks earlier than that species. Its culture is by no means difficult. Treated like the last named species, it grows and blooms freely. Our engraving shows the size of the flower, and its color as far as can be done by an engraving. This, with its allies, *i. reticulata* and *i. stylosa*, says a correspondent of the English *Garden*, is well worth a place in sheltered position in warm and deep rich soils, and in every garden.

THE IRIS XIPHION HISTRIO.

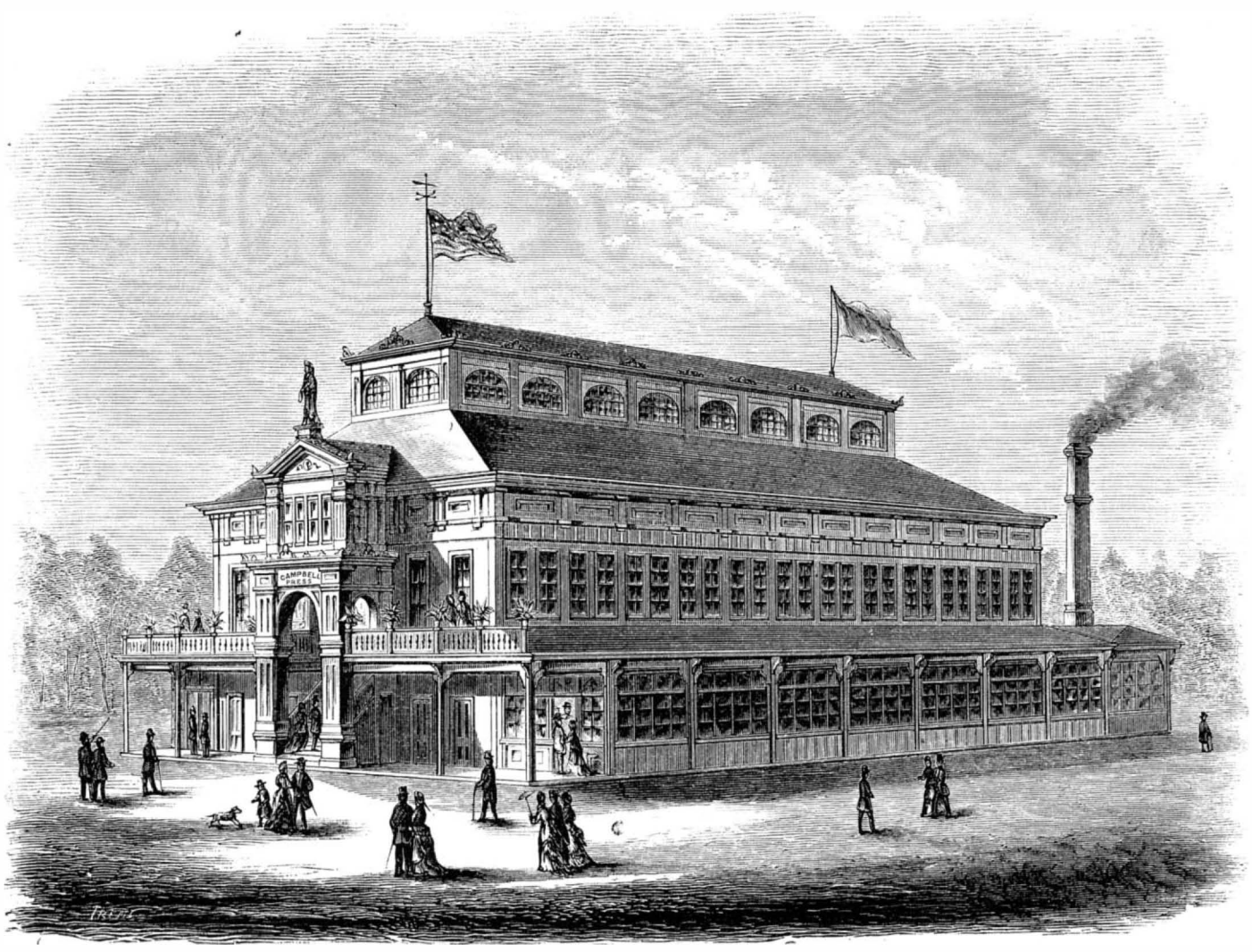
Sleep is the Best Stimulant.

The best possible thing for a man to do when he feels too weak to carry anything through is to go to bed and sleep for a week if he can. This is the only recuperation of brain power, the only actual recuperation of brain force: because, during sleep, the brain is in a state of rest, in a condition to receive and appropriate particles of nutriment from the blood, which take the place of those which have been consumed or in previous labor, since the very act of thinking consumes or burns up solid particles, as every turn of the wheel or screw of the splendid steamer is the result of consumption by fire of the fuel in the furnace. The supply of consumed brain substance can only be had from the nutritive particles in the blood, which were obtained from the food eaten previously; and the brain is so constituted that it can best receive and appropriate to itself those nutritive particles during a state of rest, of quiet, and stillness of sleep. Mere stimulants supply nothing in themselves; they goad the brain, and force it to a greater consumption of its substance, until that substance has been so exhausted that there is not power enough left to receive a supply, just as men are so near death by thirst and starvation that there is not power enough left to swallow anything, and all is over.

PRINTING MACHINERY AT THE CENTENNIAL.

While the American firm of Hoe & Sons is justly celebrated for the construction of rapid printing presses, another New York establishment claims to have succeeded in producing presses which surpass all others in nicety of adjustment and perfection of work produced. The Campbell Printing Press Company's apparatus has long been used for printing the *Aldine* and other fine art publications in this city; and the Company has erected a large and handsome building in the Centennial grounds, near Machinery Hall, in which is a completely equipped newspaper office, with editorial, composing, and press rooms. The structure is 124 feet long by 88 feet broad, and is, as will be seen in our engraving, a very ornate affair. One of the Company's rotary printing and folding machines is here to be seen, producing an edition of the Philadelphia *Evening Herald*. In the same building is a job office containing ten cylinder presses, one of which exhibits the heliotype process. There are also six job presses, all in operation. The other rooms are divided into business offices, waiting and reception rooms for members of the press, correspondents, etc., together with a telegraph and post office.

A very attractive feature of the exhibit is the original printing office of Isaiah Thomas, built in Boston in 1770. It is complete, including the press upon which the first copies of the Declaration of Independence were printed east of New York (from the Antiquarian Society of Worcester), the imposing stone (from the Worcester *Spy*), two cases, one stand, two chases, and two composing sticks (from Tyler & Sugrave, Boston). Many anecdotes and more than one romance are connected with the history of this old office, which will probably be rehearsed by editors and printers who visit it. Taken as a whole, the exhibit of the Campbell Press Company makes one of the largest and most interesting individual displays on the grounds.



THE CAMPBELL PRINTING PRESS COMPANY'S BUILDING.

Asbestos.

A curious exhibition has just been organized at the Simonetti Palace, on the Corso, in Rome. It is a display of asbestos in all the stages through which it passes, from the time that it is taken out of the bowels of the earth until it appears as a manufactured article. Asbestos is a compound of silicate of magnesia, and has the property of resisting fire. The ancients had discovered a means of weaving it, and with it made napkins for meals, wicks for lamps, and winding sheets for the dead for purposes of cremation, so that the ashes of the deceased could be collected unmixed with those of the wood which had formed the funereal pyre. The process of working this textile has been again discovered by the Marquis de Batrera, as well as the means of making with it incombustible paper and cardboard at a low price.

Blasting Cartridges and Powder-Making Machinery

The value of an improvement or invention is by no means proportional to the cost of the article produced. This is well illustrated in the simple little contrivance adopted by General P. A. Oliver, in making blasting cartridges for the use of miners and quarrymen. Every one who has had experience at the mines must have noticed the wasteful and inconvenient manner in which cartridges are prepared. A miner makes his own, using about twice as much paper, etc., as is necessary, his own time being worth from $2.50 to $3 a day; the cost of manufacture amounts to many times what it would if made by machinery, as are many similar articles. When the ground is wet, he has to use soap also, to make his cartridge waterproof; even then he is very often far from successful, and loses a portion of his powder by getting it wet.

Oliver's cartridge is made by machinery; those for dry ground have the end riveted with a copper or tinned rivet, and those for wet holes have the end formed of a double cup of tin, one setting into the other, and holding the paper of the cartridge between them. The cartridge is then coated with a waterproof coating, and is ready for use. They are made of various lengths, so that the miner has rarely to cut one, and if he has, the loss is, at most, but a few inches of paper. Manufacturing them on a large scale, the patentee can sell them at much less than it costs a miner to make his cartridges himself.

General Oliver, the manufacturer of this ingenious and useful article, has met with great success in the manufacture of powder by his patent machinery, having, during the past five years, fully established the reputation of his powder as having no superior for strength and effectiveness, and of his method of manufacture, for simplicity, safety, and economy. In his mill there is never, except in the drying house, more than some 50 or 70 lbs. of powder in any one place, so that, should it ignite, nothing more serious can result than the loss of a few pounds of powder. His well ordered works, near Wilkesbarre, Pa., with its beautiful machinery, is one of the most interesting establishments with which we are acquainted; and General Oliver has deserved well in devising a method of manufacture, by which powder, of a quality not surpassed by that of any other maker, not only can be, but has, for some years, been produced almost without risk, and at a cost for plant greatly less than in ordinary powder mills. His improvements are well worthy the attention of powder manufacturers everywhere.—*Engineering and Mining Journal.*

An Opportunity for Inventors.

A correspondent writing from Houston, Texas, calls our attention to the necessity of an invention which will prevent cotton bales expanding after leaving the press. By powerful machinery the average bale is reduced to some ten inches in thickness; it is then tied, and, the pressure being relaxed, it is removed. The bale then expands to from 14 to 16 inches in thickness, and of course occupies about twenty-five per cent more room than would be the case were it possible to keep it at the thickness to which the press reduces it. This augmentation in size obviously results in an enormous increase of freight room required, and consequently a large enhancement in cost of freight and handling. Our correspondent, who has had considerable practical experience in the subject, thinks that the trouble could be remedied if the iron bands with which the ball is strapped could be drawn tight enough while the cotton is in the press. At present, the tying is done by hand, and for each press five men have to be employed. Could all this be done by machinery, great saving would be effected.

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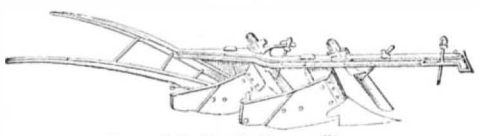
AGRICULTURAL MACHINERY.

Our extracts from Knight's "Mechanical Dictionary,"* this week, include a variety of plows and other cultivating apparatus.

The originator of the double plow was Lord Somerville, who, in 1799, devoted much attention to the practical details of agriculture. His plow, Fig. 1, which he termed a double

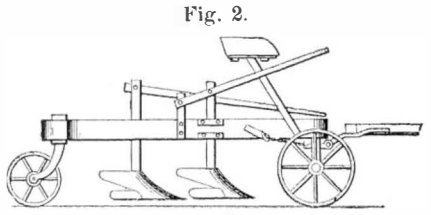
Fig. 1.



Somerville's Double-Furrow Plow.

furrow plow, consisted of a beam suitably bent for the attachment of two plows, one placed laterally and to the rear of the other. Another example is shown in Fig. 2, where the plows are moved vertically by levers. The axle is bent

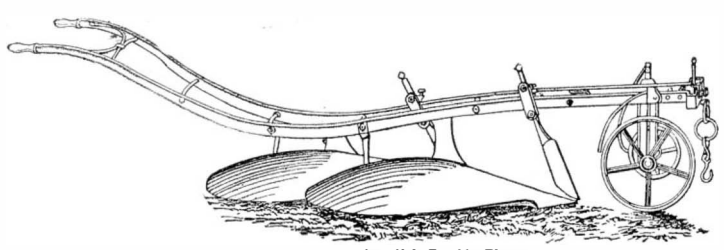
Fig. 2.



Gang Plow.

tc depress the furrow wheel, and the tongue is attached to one side of the center to suit the position of the horses. The English or skim-colter plow is shown in Fig. 3. This has

Fig. 3.



English Double-Plow.

a share attached to the colter to turn down the top soil with its weeds and refuse. The latter is covered with the main furrow slice thrown over by the larger following plow. In England and in this country another form of the same plow has been used, in which the forward portion is not merely a flange on the colter, but is a regular moldboard plow of smaller proportions, higher than, and in front of, the main plow. This is known as the Michigan double plow (Fig. 4). It requires four horses. Fig. 5 is a double shovel plow. The shovels are placed at a short distance apart, and one a little in rear of the other. It is used for cultivating purposes. Fig. 6 exhibits a double moldboard plow. A moldboard is placed on each side of the sheth, so as to throw the soil to the right and left. It is used in hilling potatoes and cabbages, but not for corn, as the rows are too far apart. Two forms of

DRAINING PLOWS

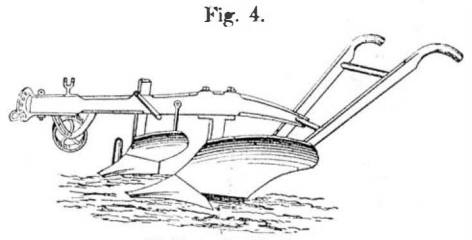
are shown in Fig. 7. A B has three colters, two mold boards, and a share. The middle colter is vertical, and splits the soil in the middle of the furrow: the two side cutters are inclined to cut the sloping sides of the ditch; the share cuts the bottom, and the moldboards lift the soil in two slices, which are deflected laterally and delivered on the respective sides of the ditch. When it is desired to cut a trench deeper than can be effected by the ordinary mode of using the plow, the arrangement shown at C is employed. An anchor or hook, *l*, is inserted in the ground, and to this is secured the pulley, *k*. The wheel, *h*, is operated by the handle above, and the plow, *c d*, is thus drawn through the soil. The arrangement at *a b* enables the operator to give the required depth to the furrow. A roller, *g*, resting on the ground supports the forward part of the plow.

HOES

were formerly made by forging, but now they are more often cut out as blanks and then struck in dies. On the left of Fig. 8 are exhibited various forms adapted to different purposes. *a* is a hoe for marking out fine drills, *b* a hoe for marking small ridges, *c* a hoe for working two sides of small plants, *d* a hoe for drawing a pair of parallel ridges. *e* is a combined hoe and rake, a very common implement, used by amateur gardeners. *f* has a serrated blade, *g* a sectional one. *k, i, j, k* are Dutch hoes, known as scuffle or thrust hoes, operated by pushing instead of striking or pulling. They are

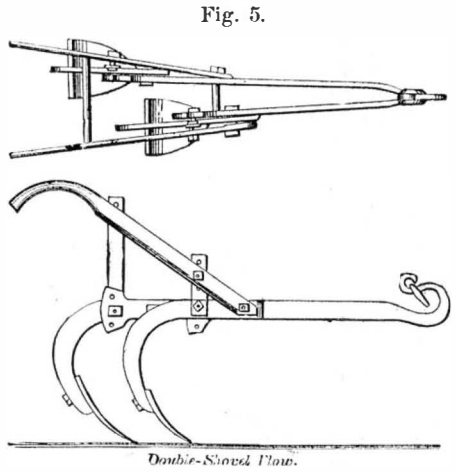
*Published in numbers by Messrs. Hurd & Houghton, New York city.

Fig. 4.



Michigan Double-Plow.

Fig. 5.



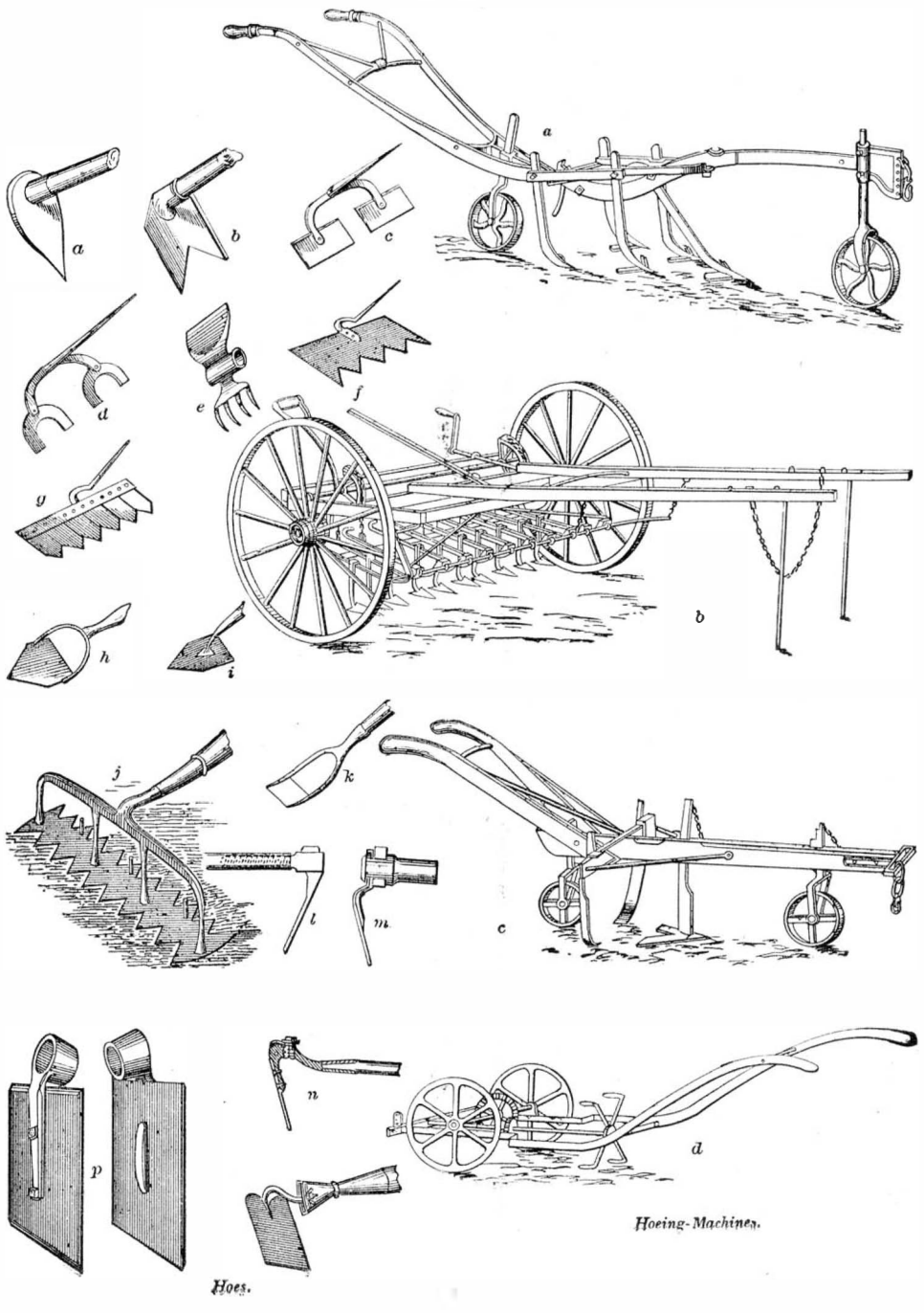
Double-Shovel Plow.

useful in extirpating weeds under bushes, and loosening the soil around growing plants. *l* shows a mode of attaching the blade to the tang, *m* a mode of wedging it in a ferrule. *n*, *o* have means of adjusting the angular presentation of the blade. *p* has a reversible blade.

HOEING MACHINES

were invented by Jethro Tull, the introducer of the system of drilled crops into England, and were designed to diminish the expense of cultivation by substituting horse labor.

Fig 8.

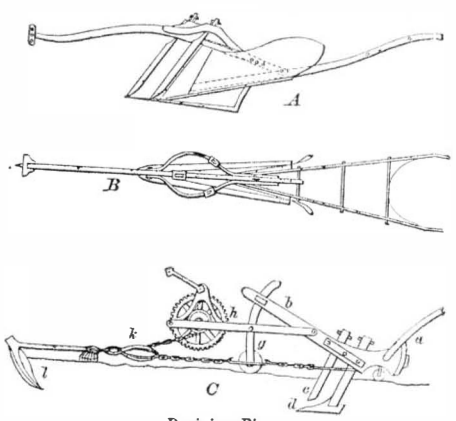


Hoeing-Machines.

Hoes.

English horse hoes, *b*, have a range of shares spaced like the drills, so as to work in the intervals between the rows of plants, such as wheat and turnips. Other English horse hoes, *a, c*, have caster wheels in front and rear, a broad mid dle share, and two or more side shares. The rear share may be curved or flat, as shown at *c* and *a* respectively. It is

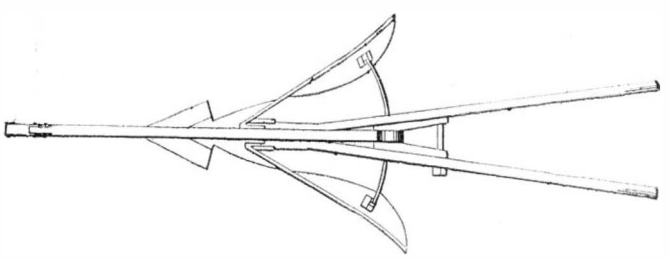
Fig. 6.



Draining-Plows.

what we should call a cultivator, but there is more of it than we regard convenient. If the tool be well proportioned, and the animal hitched to it rightly, it needs no wheel. For turning at the end of a row of corn or potatoes, it is too long. A man would need 12 feet of ground to come out on to turn, and it is not necessary to withdraw so large a marginal strip of the field for such a purpose.

Fig. 7.



Double-Moldboard Plow.

Bucknall's horse hoe, *b* (English), has a gang of 10 shares in a frame, adjustable by a lever as to hight, and also as to angular presentation of the shares to the ground. It is intended for hoeing wheat.

The horse hoe, at *d*, is designed for chopping gaps in the rows, and has a set of revolving hoes on a shaft parallel with the line of draft, and driven by bevel gearing from the main axle of the machine. As the machine advances, the hoes chop transversely across the row of plants, making intervals therein equal to the lengths of the blades.

History of Magnetism.

The earliest references to the properties of the magnet occur in the annals of the Chinese nation, who used it as a means of guiding the wayfarer over the vast and trackless plains of Eastern Asia, long before it was applied to maritime purposes. To the Emperor Hoang-Ti, who lived 2,000 years before our era, is attributed the invention of a chariot, upon which stood an elevated figure pointing to the south, independently of any position of the chariot. Nearly ten centuries later, we find the learned Tchéou-Koung presenting and teaching the use of the tchi-nânkiu, or chariot indicating the south, to some envoys from Youá-tchâng, a southern maritime province. The compass, or, as it is even now called in Chinese, *tchi-nân*, appears to have been first used at sea by this remarkable nation about the third century of our era, during the Tsin dynasty.

When the compass became known in Europe is disputed; Gilbert refers its introduction to Marco Polo about 1260, but it is probable that earlier accounts of it were brought from the East by the crusaders, an accurate description of it occurring in a poem entitled "La Bible," written by the minstrel Guiot de Provence, about the year 1190. A Latin letter ascribed to Peter Adsiger, 1269, preserved among the manuscripts of the university of Leyden, contains the following remark on the declination of the needle: "Take notice that the magnet as well as the needle that has been touched by it, does not point exactly to the poles, but that part of it which is reckoned to point to the south declines a little to the west; and that part which looks towards the north inclines as much to the east. The exact quantity of this declination I have found, after numerous experiments, to be five degrees."

The discovery of the dip of the needle is due to Robert Norman, a nautical in-

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strument maker at Wapping, near London, who is described by Gilbert as "a skillful sailor and ingenious artificer." He found that, after being touched by a magnet, the needle always appeared heavier at its northern end; and making an instrument to determine the greatest angle formed with the horizon, he observed the inclination in 1576 to be 71° 50′.

In the early part of the following century, the variation of the declination was clearly ascertained, and was attributed by Bond, a teacher of navigation in London, to the motion of two magnetic poles.

In the year 1600 was published the celebrated treatise "De Magnete," by Gilbert of Colchester, who was pronounced by his great contemporary Galileo to be "great to a degree that might be envied."

American vs. English Cheese.

About one year ago we copied, from an Irish agricultural paper, an article in which the editor was lamenting over the loss the farmers of Ireland were experiencing from the large importation of superior American cheese. He berated the Irish farmer for allowing a deterioration in his products such as to make the home consumer prefer the American cheese to the home manufacture. Now comes the London *Agricultural Gazette*, containing an article from a Lancashire correspondent on the same subject, in which he gives the English cheese makers some wholesome advice.

"On every hand," he says, "we hear people talking about cheese making being unprofitable, and discussing to what purpose they can turn their milk to a greater profit; and in some cases they are considering the prospects of feeding cattle in place of keeping a milking stock. This sort of talk amongst farmers is a new thing. For several years past cheese has fetched high prices, and such has been the demand that even inferior sorts could find a market at far above their relative value, the greatest loss being that of weight, the lowest qualities having to be kept to the last of the season, while the finest were often bought before they were made, so anxious were buyers to secure the few really fine. While prices kept up, farmers were very 'uppish'; they would not listen to any suggestions about improving their mode of making, and expected buyers to take the fearfully unsaleable cheese they made late in the season, a kind of stuff you could not properly call cheese. These late-makes resembled cheese in shape only; they possessed no solidity to the touch, and were in consistence more like very stiff bookbinder's paste. They never ripened, because they were obliged to be kept so cool, otherwise they would have swollen and become inflated like bladders; on the approach of heat, they cracked and became out of shape. Year after year many dairies finished up by making a certain weight of the kind of cheese I have been describing; and so long as dealers would buy them, so long were they quite indisposed to improve. I long felt sure that this state of things would come to an end, and that solid and firm American cheese would render such rubbishly late-made cheese unsaleable. And this has come to pass. Indeed, I feel sure that pasty, spongy, springy, late-made cheese will become unsaleable at any price. The wonder is where people have been found to eat such a salvy, pasty material; I was once told that those who bought them consumed them in the shape of toasted cheese, and that no one could eat them in any other shape. I suppose the rich milk at the latter end of the season will, in future, be turned into butter; heretofore, farmers would not be troubled by changing from cheesing to churning. Making that kind of cheese was sure to become unprofitable so soon as a sufficient supply of good cheese was obtainable from America. Now, what is the lesson to be learnt from all this? What are keepers of milking stock to do? I wonder how many of them think of associating themselves in any way for trying to learn how to remedy their shortcomings. No business will be long profitable if it is based upon ignorance, or if those engaged in it will not take the trouble to march with the times. The times are changed; consumers are no longer confined to the cheese made at home, and they will no longer be content with an inferior home-made article, be it cheese or anything else. Cheese making, like any other producing, will only be profitable when the article produced is of first class quality. If you turn out inferior or bad grain, or potatoes, or animals, they will be difficult of sale and unremunerative to the producer; and the same with cheese or butter. Farmers have been enabled to live in past days by using their hands, but they will now (like those in other occupations) have to use their brains as well. They will need to know their deficiencies, and seek to remedy them; to discard all doings—however time-honored—that lead to the production of inferior articles; they will need to learn to improve. They will find it only a loss of time to be grumbling, and better to start off learning; the latter is the only wise course, and the only one that will lead to permanent profit. They will need to avail themselves of every opportunity afforded them for obtaining useful information, whether by information from better informed neighbors, or books, or lectures, or such societies as the National Dairyman's Association. Ignorance will land them at length in poverty; intelligence and industry are the only road that will secure profit and comfort."

Dry Plates without Collodion.

The following formula was given in the *Moniteur de la Photographie* for the preparation of dry plates without the use of collodion: Albumen, 125 grammes; honey, 110 grammes; iodide of potassium, 4 grammes; bromide of potassium, 1 gramme; sea salt, 0·3 gramme. Beat the whole into a froth, let it stand for twenty-four hours, then filter. Coat a perfectly clean plate with this liquid, dry it in the drying box, and, when cold, sensitize in the usual manner. In this formula the needful addition of water seems to have been overlooked, in consequence of which omission the liquid filters but slowly.

A Transcontinental Express Train.

As we go to press a special train is rushing across the continent, attempting to travel from New York to San Francisco in the unprecedented time of 88 hours, or in 60 hours less time than is now occupied by regular trains. The start was made from Jersey City at 1 A. M., on June 1, three cars being attached to a new engine, the tender of which carried 2,400 gallons of water and 136 bushels of coal. The ninety miles between Jersey City and Philadelphia were covered in ninety-nine minutes. At 10:40 o'clock on Thursday morning, Pittsburgh was reached; and at 10 o'clock on the same evening, the train stopped at Chicago, having completed the distance of 907 miles in 20 hours and 57 minutes, averaging over 43 miles per hour. The distance from New York to Pittsburgh, 439 miles, was made without changing locomotives. Both before and after reaching that city the speed of a mile a minute was often attained. At 4:15, on the afternoon of June 2, Willow Island, 250 miles west from Omaha, was reached. This was the halfway station; and the total distance from New York, 1,645 miles, was accomplished in 39 hours and 12 minutes, showing an average of over 42 miles per hour.

The train reached Council Bluffs at 9:27, 39 minutes ahead of the schedule time. It made the run from Chicago to the Missouri river in 11 hours and 15 minutes. It made one run of 79 miles in 75 minutes, and another of 45 miles in 44 minutes. This is an average of a mile, respectively, in 58 and 58·6 seconds. The fastest time made since the train left New York is stated to have been on the Chicago and North-Western Railway, where 2½ miles were run in 2 minutes, or 1 mile in 48 seconds, being at the rate of 75 miles an hour. This is said to be the longest and fastest continuous run that has ever been made on any road in any country.

The Spectroscope a Witness in a Forgery Case.

A remarkably ingenious and novel application of the spectroscope as a witness in a case of alleged forgery, now on trial in this city, was recently made by Dr. P. H. Vander Weyde. A suit was brought to recover, on a check, a large sum of money from a bank which, the plaintiff alleged, had certified the document. The bank in defense claimed that the certification was a forgery, and among other statements asserted that the ink used was not the same as that employed on other checks certified by the same person on the same day. Dr. Vander Weyde was called as an expert witness to determine this point, and he appeared in court armed with a powerful microscope having a spectroscopic eye piece.

By carefully observing the spectrum of sunlight reflected from the surface of the paper covered with different inks, and then passed through the spectro-microscope, he previously had satisfied himself that all inks, other than black, such as Prussian blue, carmine, anilin red, etc., absorb certain parts of the solar spectrum, so that it would be a certain and easy way of recognizing the identity of the two inks to note the fact that both produced an absorption of and so blotted out exactly similar parts of the solar spectrum. This, of course, was spectrum analysis produced otherwise than by examining the incandescent vapor of the substance, an obviously impracticable proceeding here.

On the witness stand, Dr. Van der Weyde was given a variety of checks from the bank, together with the particular document on which the suit rested. The microscopic part of his instrument magnified the writing so highly that the dot on an i was sufficient for all purposes. The result was that the ink of the alleged forged signature and that of the bank's genuine writing gave exactly the same absorption spectrum, and hence were pronounced identical, and this although the check in suit had been handled and exposed to the light until the ink had faded considerably. We will soon publish a complete account of this very interesting investigation.

Growing Tuberoses.

To cultivate that tuberose, the most beautiful of all plants, says an experienced horticulturist, put the bulbs in six inch pots, three in each, and use a mixture of equal parts turfy loam, peat, and leaf mold, and place them in a pit. Give very little water at first; and as they commence to grow freely, increase it, and keep near the glass. When they begin to push up their flower spikes, they will of necessity require to be placed where they will have sufficient space for the proper development of the tall spikes. These will come into bloom from August to October, when they will require a temperature ranging from 60° to 70°, the latter being preferable.

Direct Manufacture of Soap with Salt.

If grease, fat, or rosin, which are commonly employed to make soap, are heated with an excess of common salt, ammonia, and water, a soda soap separates, leaving chloride of ammonia in the liquor, together with the excess of ammonia and salt. This reaction is the consequence of the great solublity of ammonia soap in ammoniacal water, and the insolublity of soda soap in water containing more than ½ per cent of salt. The ammonia at first unites with fatty acids; then the sodium in the salt exchange places with the ammonia in the soap, forming, as we said, a soda soap and chloride of ammonia. It is essential that there be an excess of ammonia and salt present in order that the reaction take place. One hundred parts of grease requires 15 to 20 parts ammonia, 20 to 30 parts salt, and 200 to 300 of water.—*T. N. Whitelaw, in Chemisches Centralblatt.*

Physicing Iron in Puddling.

An invention of Mr. John Haythorne, of Clifton, near Bristol, England, has for its object improved means of producing from the puddling furnace a superior quality of iron by the use of a certain composition, which is thrown into the puddling furnace while the metal is in a fluid state, before it comes to nature, and by which means the impurities still remaining in the iron are removed, and its quality improved. The composition, which he has found to answer in practice, according to the London *Mining Journal*, consists of peroxide of manganese ½ lb., oxide of tin, zinc, or lead ½ lb., quicklime, potassa, or soda ½ lb., saltpeter or ammonia ½ lb., brick-dust or calcined clay ½ lb. = 2 lbs. These are to be carefully reduced to a fine powder, and thoroughly dried. These proportions may be modified or increased as found desirable, according to the quality of the pig iron used.

Superior Longevity of Israelites.

Dr. B. W. Richardson, of London, last month delivered a lecture on this subject. The result of his research has shown that, both on the Continent and in England, Jews possess a higher vitality than do the general community by whom they are surrounded. Tracing the causes for this greater longevity, the lecturer said he could not attach too much importance to the sanitary laws that obtained among the Jews, instancing those in regard to diet, cleanliness, and abstinence from strong drink. In fact, the Decalogue, from beginning to end, is one sanitary lesson, teaching them to subdue the passions which torment the brain and distress the body.

A Good Kalsomine.

Take 4 lbs. Paris white, put in a pail, cover it with cold water, and let it stand over night; put into a tin kettle a handful of glue, cover with cold water; in the morning set the glue on the stove, and add enough warm water to make a quart, and stir until dissolved; add the glue to the Paris white, stir well, and pour in enough warm water to make a pail three quarters full; then add bluing, a little at a time; stir well until it is very slightly bluish. Use a good brush; go over one place in the wall until thoroughly wet; if your brush dries quickly, add more warm water, as the mixture is too thick; the brush must be kept wet. This mixture costs 38 cents.

DECISIONS OF THE COURTS.

United States Circuit Court—Southern District of New York.

PATENT BUNG BUSH.—GEORGE B. CORNELL *vs.* LOMAX LITTLEJOHN.

Johnson, C. J:

A decision on a preliminary application for an injunction is not of controlling weight in another circuit.

The Cornell reissued patents Nos. 5,026 and 5,027, of August 6, 1872, the one being for a bung bush, and the other for a wrench for operating such bush by direct positive engagement, are not infringed by the use of a bush and a wrench in which the engagement is effected by frictional contact, and in which the bush is so constructed that the patented wrench cannot be used with it.

[*S. A. Goodwin.* for plaintiff.
S. A. Duncan, for defendant.]

NEW BOOKS AND PUBLICATIONS.

THE PACIFIC TOURIST, a New Illustrated Transcontinental Guide of Travel from the Atlantic to the Pacific Ocean. Price $1.50. Edited and Published by H. T. Williams, 46 Beekman street, New York.

The fast train which, at the time we write, is attempting the extraordinary feat of crossing the continent in eighty-eight hours will, without doubt, draw renewed attention to the modern facilities for reaching the most picturesque and beautiful portions of our national domain. To those who contemplate a trip to San Francisco over the Union Pacific Railroad, the above-named volume will prove of much use, as it not only embodies information regarding the railroads, stage routes, distances, and fares to a principal points, but it describes the wonders of Western scenery, supplementing the description with a lavish display of illustrations.

A CENTENNIAL PICTURE.—A large and handsomely executed Centennial commemorative picture has just been issued by Witteman Bros., 184 William Street, New York. The central portion is occupied by an equestrian portrait of Washington; the ornamental border is filled with appropriate legendary devices. See advertisement in another column.

Recent American and Foreign Patents.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED COTTON-GIN FEEDER.

John W. Webb, Union Springs, Ala.—This is an improved machine for feeding cotton regularly to a gin, and so constructed as to allow sand and other hard substances to drop out. To this end the cotton passes over a pivoted rack, made of wood or wires, placed at a suitable distance apart.

IMPROVED TWEER.

Thomas F. Witherbee, Port Henry, N. Y.—This consists of a partition in the water chamber between the inlet and outlet pipes, to compel the water for cooling the tweer to pass entirely around it.

IMPROVED CAR COUPLING.

Rocco Misso and Bishop J. Warner, Macon, Miss.—This consists of a drawhead with lateral rock bar, with outside rest piece and weight that is struck by a bumper at the end of a forwardly projecting arm of the connecting drawhead to drop the pin-holding rod.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED WIRE FENCE.

Schuyler Jenks, Jefferson, Wis.—This consists in the combination, with double T posts and twisted wire rails, of the wire staples and a long vertical wire.. The staples secure the wire rails, and are themselves fastened by the vertical wire.

IMPROVED GAGE FOR TEACHING PENMANSHIP.

Lorenzo Dow Harvey, Sheboygan, Wis.—This is a gage made of transparent substance, having lines cut upon it in such a manner that it may be used for measuring the length, width, slant, and spacing of letters and figures in writing.

IMPROVED SHOE.

John C. Weil, Baltimore, Md.—This consists of a secondary insole, held in position by tags of muslin secured between the outsole and insole, and pasted down. The idea is to make the shoe easier to wear and less heating to the foot.

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HEATER FOR MELTING WAX FROM ELECTROTYPE CASES.

John E. Parker, Boston, Mass.—The case is made with steam-tight double walls upon its bottom, top, sides, and back, to form a steam space. The steam spaces at the top and bottom of the case are connected by pipes, to increase the heat in the interior. In the center of each lower bottom is a pan—the two being concentric—the outer one receiving the water of condensation. Between vertical guide bars, on the inner case, wax cases are inserted edgewise. With this apparatus, when the shells have been removed from the cases, the cases are inserted between the guide bars and the wax, as it melts off, runs down into the inner pan, where it is kept melted ready to be again used.

IMPROVED TICKET HOLDER.

Daniel Shamberger, Beckleysville, Md.—This is a slotted holder applied by a screw pin, and securing the ticket by a clamping screw. The ticket is thus tightly and securely retained and conveniently exhibited for inspection when applied to the coat or hat.

IMPROVED ICE PICK

Herman F. Dernell, Athens, N. Y.—This consists of a number of tines, or a cutting blade, set into a sectional head, and attached by fastening screw bolts. By extending the recesses of the head, a cutting blade may be inserted into the head, and the tool then be used for separating the cakes when taken from the ice house.

IMPROVED COMPOSITION FOR CIGAR LIGHTERS.

William J. Littlefield, Philadelphia, Pa.—Small glass rods are dipped into a mixture of lime, charcoal, cascarilla bark, gum and water, until a sufficient deposit is formed to make heads. The latter are then tipped with fulminate. When lit, the head becomes a red hot coal and lasts some time, and the glass, being a nonconductor of heat, enables the lighters to be conveniently handled.

IMPROVED APPARATUS FOR DRYING HIDES.

John Finnigan, Houston, Tex.—By the mode of drying the hides here patented, they are spread over portable frames constructed to keep the inner surface of the hides from coming in contact with each other, to allow the air to circulate between their sides freely, and to allow the rain to run off, so that bad weather will not harm them.

IMPROVED STOP ACTION FOR REED ORGANS.

Eugene H. Schofield, Mendota, Ill.—This consists of stop draws connected by crank shafts and connecting rods with the valves in in such manner that the action is improved. The stop draws may be located more closely together in the front board, and the latter may be shortened so as not to extend beyond the keys, and thus do not obstruct the sound so much as the board used in the common arrangement.

IMPROVED ABDOMINAL SUPPORTER.

Cyrene Smith, New York city.—This consists of a supporter that is laced at the back, and adjusted by upper front and lower rear gussets, with lacing strings, in connection with the front and side gussets, with elastic bands, to the condition of the abdomen. The front part is stiffened by stays, and extended to sufficient length to to take up and support, by a curved anterior pad, the weight of the abdomen, and transfer it to the hips and back.

IMPROVED SLATE.

Claudius Verdier, Detroit, Mich.—This consists of a school slate whose frame is arranged with a pencil receptacle at each side, closed by a door. There is also a pencil-sharpening device.

IMPROVED ANIMAL NOSE BAG.

Craton H. Williams, New York city.—This consists in suspending the nose bag by knotted ends which pass over pulleys on the head stall, and are slipped over the check rein hook. The horse can thus raise his nose to the top, but not outside of the bag, and is prevented from scattering and wasting his feed, while he is allowed to chew his grain without breathing directly into the bag.

IMPROVED BUTTON BOOT.

Christoph Stickel, New York city.—By this construction, there is no seam upon the top of the foot, and upon the heel where the most of the wear from a dress or pantaloon leg comes, so that it will not rip, and at the same time a neatly-fitting, stylish boot will be produced. By cutting the shoe in two pieces, it will give any additional hight and shape, thus enabling the foot to be fitted perfectly and the employment of only a half seam behind.

IMPROVED BUCKLE.

Joseph M. Junkin and John Gunn, Red Oak, Iowa.—This consists in arranging a buckle tongue on a detachable shaft, and between loose spacing tubes. The contrivance is desirable for repairing a buckle or replacing a broken one, the buckle being in this case easily taken off from the strap.

IMPROVED WHIP SOCKET.

Thomas L. Whitacre, East Rochester, Ohio, assignor to himself, Edward F. Whitacre, and George T. Whitacre, same place.—This invention consists of a whip socket with clamping spring and locking cam.

IMPROVED PEN RACK.

Carol E. Kusel and Carl H. E. Bechert, Oroville, Cal.—This is a pen rack applied by springs to an ink bottle or stand, and having bent wire arms, forming racks for penholders.

IMPROVED LAMP BURNER.

Benjamin Franklin Flint, Westfield, Pa.—This is a device for removing the snuff of lamp wicks in a convenient manner, without extinguishing the light and requiring the taking off of the chimney. It consists of a spring and hook-shaped cutter, that is carried by a suitable lever device.

IMPROVED SKIRT PROTECTOR.

Albert Lyons, New York, assignor to James W. Chisholm, Brooklyn, N. Y.—This is a compound skirt protector and trimming, formed of a ply strip and an ornamental strip, connected by binding near the upper end. The trimming is sewed at its lower edge to the upper part of the hem of the ply strip.

IMPROVED SHADE STANDARD.

Henry F. Walton, Woodman, Wis.—This is a standard for holding a shade or umbrella. It has a joint at the base for lying down flat when not required for use; also, a joint for turning the shade around to any direction, and also a joint for shifting the shade to any desired inclination.

NEW AGRICULTURAL INVENTIONS.

IMPROVED CHURN.

William B. Nunn, Edmonton, Ky.—This invention consists in means for securing the churn barrel in place. The upper end of the dasher shaft revolves in a socket in the cross bar, the ends of which enter mortises in the side cross bars of the frame. The cross bar is held down upon the end of the dasher shaft by a wedge inserted in the wide mortise above the end of the cross bar.

IMPROVED HAY ELEVATOR.

Michael M. Shellaberger, Hamilton, Mo.—When the block from which the fork is suspended rises near to the beam, it strikes the dropping roller frame and lifts the rollers out of a check to allow the carriage to be drawn along to the place of discharging by the hoisting rope. At the same time the frame closes the retaining jaws under the hoisting block, and holds it from falling until it drops into the check again. There is also a contrivance of a return cord for drawing the carriage back, so that its connection with the carriage is by a grip of the hoisting block with the check frame when the block comes up to it. This connection ceases when the block drops, leaving the return cord free to run back as long as the hoisting cord does, and the horse moves back, by which the slack of the return cord is avoided.

IMPROVED HAY ELEVATOR.

Hector Toofs and Clinton Toofs, Jefferson, Ind.—This consists of a claw lever arranged with the carriage from which the hoisting fork descends, and with the hoisting ropes. There is a stop piece against which said hook lever strikes when the carriage runs out to the place of taking the load, so that it hooks under the head of and engages the hoisting fork, to hold it while running in the barn with the load and out again, and disengages it at the moment the truck comes out to the hoisting place.

IMPROVED CORN HULLER.

George Washington Richmond, Springfield, Ill.—This relates to improvements in corn-hulling machinery for producing hominy, and constructed in such a manner that the corn is fed continuously at the top and discharged in hulled state at the bottom. The shaft with the rasp-cut hullers is revolved with great rapidity without being liable to breakage or injuring the machine.

IMPROVED GRAIN BAG.

Arthur McKenna, New York city.—This grain bag may be readily filled and securely closed without sewing up the mouth. It has stitched corners or shoulders and an interior mouth-closing flap, and an exterior overlapping flap that is retained by a suitable fastening device.

IMPROVED WHEEL CULTIVATOR.

Hazen H. Perkins, Osceola, Ill.—This is an improved riding cultivator, which includes a large amount of new and ingenious mechanism, so arranged that the plows may be readily guided and controlled, when at work, by the driver with his feet, and may be supported above the ground when passing from place to place.

IMPROVED BAR FOR PLOW SHARES.

Isaac N. Pyle, Decatur, Ill.—This invention consists in iron and steel bars, as a new article of manufacture, rolled flat upon one side, with a wide bevel to an edge along the forward edge of the bar, and a narrow bevel not to an edge along the rear edge of the bar.

IMPROVED HORSE POTATO FORK.

George C. Clark, Freehold, N. Y.—The rake head is made in two parts, which are bolted together, and in the adjacent faces are formed notches to receive teeth, which are thus clamped between the parts of the said head. The teeth are bent in opposite directions, to keep them from longitudinal movement, and to give them somewhat the shape of a scoop shovel, bringing them into better position for doing their work.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED VEHICLE HUB.

Antonius Van Geel, Rahway, N. J.—When the spokes are driven into the socket ring, wedge rings spread the spoke ends, and produce the rigid socketing of the same, the spokes being firmly held against side motion by metallic binding strips. Slits in the spoke ends admit the ready spreading of the same, and their elastic seating in the hub.

IMPROVED CARRIAGE SPRING FASTENER.

Franklin Miller, Indianola, Ill.—This invention consists of a seat block or plate and a cap plate of peculiar construction, for mounting and securing the springs of carriages on the axles. The novelty consists in the combination of the cap plate, having bolt hole projections, with the plate or seat block having similar bolt hole projections, the said projections of both plates being extended beyond the faces, to prevent lateral movement of the springs.

IMPROVED WAGON BODY AND FRAME.

Isaac G. Sallee, Montgomery, Ky.—This is so constructed that the body may be detached without affecting the frame, so that the wagon may be used with a frame or a body, as may be desired.

IMPROVED HARNESS.

Charles H. Corey, San José, Cal.—These are improved winker stays of rubber, for harness, which are so constructed that they will not become limp and lose their shape from use or wet.

IMPROVED SASH PULLEY.

Arthur R. Watterson, San Francisco, Cal.—This invention consists in securing the shaft of a sash pulley by fins formed thereon, and fitting in corresponding elongated slots of the pulley and of one of the side plates.

IMPROVED CARRIAGE THILL.

Nelson Mitchell, Ellsworth Falls, Me.—In order to improve the construction of carriage thills, so as to prevent them from being broken should the horse accidentally step upon them. This inventor proposes to provide them with a rubber forward end.

IMPROVED ROPE TRACE.

Peter Hayden, New York city.—This is an improved device for connecting the end of an ordinary rope trace with the hame and the whiffletree. It consists in a tapering ferrule, having a screw hole through its base, and a tapering eye screw, in combination with each other, to receive and hold the end.

IMPROVED SHEET METAL ROOF.

Charles A. Smith, Hanoverton, O., assignor to himself, Nathan A. Halderman, and Charles Chandler, of same place.—This sheet metal roof may be laid in a perfectly weatherproof manner, without the use of nails, screws, or rivets passing through the roof plates. Lap joints with interlocking anchor caps are placed intermediately, and folded to extend over the adjoining flanges of the sheets.

IMPROVED BARN DOOR FASTENING.

Perry A. Peer, Comstock, Mich.—This consists of a strong hook of cast iron, with a beveled nose to the hook end, having considerable breadth of surface, for sustaining the shocks and wear of a heavy barn door. Said hook is pivoted in a strong base, adapted to be attached to the side of a barn, and support the hook outside of the battens of the siding, so that when the door swings open it will strike the nose of the hook and swing it back, pass the hook nose, and strike a strong arm projecting beyond the pivot. The hook is thus swung so as to engage and secure the door.

IMPROVED WINDOW SHADE FIXTURE.

Charles De Quillfeldt, New York city.—A metallic cap is attached to the end of the roller, and has a hollow axial drum, on which the cord for rolling up the curtain winds. A metal disk for carrying centrifugal pawls is clamped against the end of the hub. The pawls are fitted on pivot studs, which are so located that, when the pawls swing out to lock the roller, the toes touch the hub of the disk and hold them in the position for locking. These studs are cast together with the plate. A notch in a cam disk receives the pawls and locks the roller when the motion is quick enough to throw them out into it by centrifugal force. Said notch is so located that the pawls are kept out of it by gravity when the motion is slow enough for the gravity to exceed the centrifugal force. The parts are all simple, and they are so contrived that but little labor is required in fitting them to the roller.

NEW TEXTILE MACHINERY.

IMPROVED METHOD OF MAKING ENDLESS WOVEN FABRICS.

David Bailey, Dresden, Ohio.—This invention is an improvement in the manufacture of endless cloths, such as are known as felts for paper makers' and others' use. The cloths or felts are woven in different layers, with folds on the opposite sides of the loom, formed by working the filling or weft in the different layers passing around the fabric in regular order, through the layers one after the other, and thus producing the endless fabric. The felts can be made in any desired length and width, and of the different qualities required by paper makers.

NEW HOUSEHOLD ARTICLES.

IMPROVED WASH BASIN VALVE TRAP.

William W. Hurd, New York city.—This consists of a trap formed of a casting made with an open side, so formed as to fit against the side of a wash basin, and with an opening in its bottom, closed with a valve. The object is to prevent escape of sewer gas.

IMPROVED ROASTING PAN.

John G. Peace and John S. Wingfield, Salem, Mo.—This consists of a drip pan with a closed top, for inclosing the article to be roasted, and having a water pan in the bottom, below a perforated support for the roast. The water pan is so arranged that it can be drawn out at any time for filling without disturbing the roast, the object being to maintain an atmosphere of steam surrounding the roast, to protect it from burning by too much heat.

IMPROVED IRONING BOARD.

Eli O. Catt and Henry H. Harrod, Red Oak, Iowa.—This invention consists of a board with a spring at one end, suitable for straining the neck and shoulders of a shirt against, and a roller at the other end pressed against it by springs. This is contrived to pinch the body of the shirt against the end of the board, and strain the bosom tightly over the board, so as to draw it smooth and hold it with elastic tension for ironing it.

IMPROVED GARBAGE BOX.

Benjamin Burling, Whitehall, N, Y.—This box is formed of a case provided with two drawers, and with a dome inclosing a perforated part of its top. The dome has an upper orifice, closed with a screw cap. A disenfectant is put through the dome aperture, and the dome is covered with a cap to more thoroughly confine the disinfectant and prevent it from escaping into the air.

IMPROVED ASH-SIFTING SHOVEL.

Edward B. Neal, Wiscasset, Me.—This is an improved shovel for sifting the ashes of furnaces, and cooking and other stoves, without the annoying and penetrating dust that is raised by the common ash sifters. It has wire tines and side guards applied to a fastening head and handles.

IMPROVED SHUTTER.

Gustav Hampe and Adolf Schallert, St. Louis, Mo.—This consists of a shutter made in sections, that slide in guides of the window casing, and form a covered panel in front of the window sill. The window may readily be closed in part, or throughout, by raising one, two, or all the sections, as desired. When the shutter is entirely opened the sections are entirely stored away back of the innermost or panel shutter, at the lower part of the window in a convenient manner.

IMPROVED SPRING BED BOTTOM.

Joseph Eckart, New York city, assignor to Louisa Eckart, of the same place.—Angle straps are attached to the base slats of a spring bed bottom, to adapt it to receive a detachable cover, the straps having knobs which enter eyelet holes in the latter. The cover is designed to prevent the mattress from being worn by the springs, and when worn or soiled it may be detached and mended, or replaced.

IMPROVED DRUM ATTACHMENT TO HEATING STOVES.

Richard L. Ball, Terre Haute, Ind.—This consists in a flange about the fire chamber, connected with tubes that pass through a top drum, and provided with a register. Inside of the drum is a cylinder which, when closed, throws the heat into the surface of the drum so as to prevent the direct escape of the same through the hood and pipe.

IMPROVED STOVE PIPE SUPPORTER.

James L. Loring, Dallas Center, Iowa, assignor to himself, Fortunatus Hubbard, and Judson Purinton, of the same place.—This is an improved stovepipe supporter, by which stovepipes may be readily suspended from the ceiling or supported on the walls. It consists of a stovepipe encircling ring that is applied to a recessed block having a fixed wire rod with threaded edge.

IMPROVED WASHING MACHINE.

John M. Gano, Newport, O.—This consists in an outer washtub, a lateral clothes box, and a step-shaped perforated plunger combined. The machine works in the nature of a pump, and draws the water continually through the clothes, which are squeezed at each down stroke so as to expose them to the influence of the water drawn in by the next up stroke, and so on until the clothes are entirely cleaned.

IMPROVED DESK.

Henry M. Elbreg, Greenfield, Ind.—This writing desk consists of a case having hinged doors, revolving cylindrical racks, stationary pigeon holes, and a pivoted table, together with suitable apparatus for supporting the same.

IMPROVED CURTAIN CORD FIXTURE.

Horace Resley, Cumberland, Md.—This invention relates to means whereby a curtain roll cord may be regulated and adjusted to hold the curtain at different elevations, in a quick, easy, and effective manner. It consists in passing the cord around a pulley or grooved cap on the upper end of a side-notched rod, bar, or plate, which has a stop or handle at bottom and slides in an obliquely arranged keeper whenever turned slightly out of its perpendicular position.

IMPROVED BAKE PAN.

John Gilbert, Newark, N.J.—This pan has straight sides and ends and scalloped corners. It is struck up out of sheet metal at one operation, and may thus be made more readily and at less expense than when made in the old way.

IMPROVED DOOR AND WINDOW FASTENER.

John H. Daniels, New York city.—This is composed of a wedge between a bottom and top plate, the latter being jointed to the former near the apex of the angle, so that, by removing the wedge from between the plates, the top one will drop and free the door to let it close or open. The bottom plate has a stud for pressing into the floor to prevent it from sliding.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a Line for each insertion. If the Notice exceeds Four Lines, One Dollar and a Half per Line will be charged.

Agricultural Implements and Industrial Machinery for Export and Domestic Use. R.H. Allen & Co., N.Y.

For Bolt Forging Machines and Power Hammers, address S. C. Forsaith & Co., Manchester, N. H.

Best Belt-Pulleys—A. B. Cook & Co., Erie, Pa.

Wanted—A good Feather Renovator. Address—giving price—Thompson & Co.,84 Wood St.,Pittsburgh,Pa.

Steam Engines—25 per cent. extra power, or an equal saving in fuel guaranteed, by applying the R.S. Condenser. T.Sault,Consit'g Eng'r,Gen. Agt.,New Haven,Ct.

Centennial Exhibition, Philadelphia.—Examine the Allen Governors, Machinery Hall, D. 9, Par. 71.

Machine-cut brass gear wheels, for models, &c. List free. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Situation Wanted by a practical Rubber Manufacturer; understands using Old Rubber, and can get up goods at low cost. H. A. R., Boston, Mass.

Horse Nail Machines—Wanted correspondence with Manufacturers of Horse Nail Machines, for purpose of purchasing. J. W. Britton, 18th Ward, Cleveland, O.

400 new and 2nd hand Machine Tools, Wood Working Machines, Pumps, Water Wheels, Engines, Boilers, &c., for Sale. See first column, page 397.

Wanted.—Shafting lathe,2d hand. Address,Ohio, Box 773, N. Y. P. O., with price.

For Sale.—35 in. 16½ ft. Lathe, $400; 22½ in. 22 ft. do., $250; 20 in. 7 ft. Stover do.,$215; 13½ in. 6½ ft. do. and chuck, $125; 9 ft. Planer, $390; 12 in. Slotter.$390; Profiling Machine,2 spindles, $250. Shearman,45 Cortlandt St. N.Y.

Rubber Hydrant Hose, Hose Pipes and Couplings, best quality. Send for Prices to Bailey, Farrell & Co., Pittsburgh, Pa.

Wanted—Situation as Supt. or Foreman of Machine Works or Shop, by Machinist of 22 years' experience. Address Machinist, P.O. Box 383, Chicopee, Mass.

"Dead Stroke" Power Hammers—recently greatly improved, increasing cost over 10 per cent. Prices reduced over 20 per cent. Hull & Belden Co., Danbury, Ct.

Driving Belts made to order, to accomplish work required. Send full particulars for prices to C. W. Arny, 148 North Third St.. Philadelphia, Pa.

Power & Foot Presses & all Fruit-can Tools. Ferracute Wks., Bridgeton, N.J. & C. 27, Mchy. Hall, Cent'l.

Johnson's Universal Lathe Chuck—Awarded the highest Premium by the Franklin Institute of Phila., for "Durability, Firmness, and adaptation to variety of work." Lambertville Iron Works, Lambertville, N. J.

Artesian Wells—Contractors for Boring will address John Y. Gill, Mayor of Fayetteville, Tenn.

Parties desiring an American (posted on Engines) as Chief Engineer, address A. M. C. E., Lawrence, Mass.

400 new and 2nd hand Machine Tools, Wood Working Machines, Pumps, Water Wheels Engines, Boilers, &c., for Sale. See first column, page 397.

Safety and Economy—Eclipse Sectional Steam Boiler. First Class references. Lambertville Iron Works, Lambertville, N. J.

Woman's Shoes—Patent for Sale, either whole or State Rights. Address C. Steckel, 199 Allen St., N.Y.

Engine Builders and Mill Furnishers, send Circulars or Card to Benson Brothers, Centralia, Ill.

For Sale—24 in. x24 ft. Lathe, with Chuck; two 18 in. Lathes; one 7 ft.x24 in. Planer; two 8 in. Shapers. E. P. Bullard, 48 Beekman St., New York.

The Photo-Engraving Co. have been obliged to remove from 62 Cortlandt St. to a larger building at 67 Park Place. Their Relief Plates for Newspaper, Book, and Catalogue Illustrations are rapidly taking the place of Wood Cuts and are unsurpassed. See advertisement in another column of this paper.

For the best Patent Self-Opening Gates for Carriages, in any Style of Wood or Iron, address Cottom & Co., Dayton, Ohio.

Split-Pulleys and Split-Collars of same price, strength, and appearance as Whole-Pulleys and Whole-Collars. Yocom & Son, Drinker St., below 147 North Second St., Philadelphia, P.

400 new and 2nd hand Machine Tools, Wood Working Machines, Pumps, Water Wheels, Engines Boilers, &c., for Sale. See first column, page 397.

The Bastet Magnetic Engine for running Sewing Machines, Lathes, Pumps, Organs, or any light Machinery, 1-32 to ½ horse power. Agents wanted. Address with stamp, 1,113 Chestnut st., Philadelphia, Pa.

The French Files of Limet & Co. have the endorsement of many of the leading machine makers of America. Notice samples in Machinery Hall, French Department, Centennial Exposition. Homer Foot & Co., Sole Agents, 22 Platt St., New York.

Trade Marks in England.—By a recent amendment of the English laws respecting Trade Marks, citizens of the United States may obtain protection in Great Britain as readily as in this country, and at about the same cost. All the necessary papers prepared at this Office. For further information address Munn & Co., 37 Park Row, New York city.

Shingles and Heading Sawing Machine. See advertisement of Trevor & Co., Lockport, N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, New York.

Steel Castings, from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, &c.

Hotchkiss & Ball, Meriden, Conn., Foundrymen and workers of sheet metal. Fine Gray Iron Castings to order. Job work solicited.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon, 470 Grand Street, New York.

Spinning Rings of a Superior Quality.—Whitinsville Spinning Ring Co., Whitinsville, Mass.

Rotary Fire or Supply Pumps, belted, two styles built—One, plain, $125; the other, with water gage, safety valve, and air chamber, $175. Capacity, 10 to 500 gals. per minute. M'f'rs, S. C. Forsaith & Co., Manchester, N.H

For best Bolt Cutter, at greatly reduced prices, address H. B. Brown & Co., New Haven, Conn.

Diamond Tools—J. Dickinson, 64 Nassau St., N. Y

Temples and Oilcans. Draper, Hopedale, Mass

Hotchkiss Air Spring Forge Hammer, best in the market. Prices low. D. Frisbie & Co., New Haven, Ct.

Patent Scroll and Band Saws, best and cheapest in use. Cordesman, Egan & Co., Cincinnati, Ohio.

Notes & Queries

R. G. S. will find directions for turning cast iron on p. 364, vol. 31.—W. H. S. is informed that we cannot recommend an incrustation preventive unless we know the nature of the impurities in the water.—M. will find a description of dynamite on p. 212, vol. 33.—C. H. M. will find full directions for making rubber stamps on p. 156, vol. 31.—W. C. E. can ascertain the amount of moisture in the air by using an hygrometer. See p. 116, vol. 33.—W. S. will find directions for ebonizing wood on p. 50, vol. 33.—F. C. will find directions for making baking powders on p. 123, vol. 31.—J. A. will find a recipe for black paint, suitable for iron smoke stacks, on p. 379, vol. 31.—J. E. C. will find directions for tinning iron castings on p. 362, vol. 31.—J. C. K. will find directions for transferring prints on p. 138, vol. 30.—G. R. W. can calculate the power of his steam engine by the formula and table given on p. 33, vol. 33. For formula for safety valves, see p. 107, vol. 31.—J. J. B. will find on p. 187, vol. 32, directions for making battery carbons. The amalgamation of zincs is described on p. 27, vol. 30.—G. R. will find a formula for safety valves on p. 330, vol. 32.—J. H. Z. should use aquarium cement for making his fish tank. See p. 80, vol. 31. This also answers W. H. —A. A. H. will find directions for gilding picture frames on p. 347, vol. 31.—G. W. B. can prepare soluble glass for painting outdoor work by following the directions on p. 315, vol. 31.—C. M. B. will find directions for making a phosphorus lamp on p. 10, vol. 27.—J. P. A. will find directions for casehardening malleable iron on p. 69, vol. 31.—J. H. will find directions for making paste blacking on p. 139, vol. 31.—F. L. can galvanize his shingle nails by following the directions on p. 346, vol. 31. —F. L. W. will find on p. 251, vol. 29, directions for waterproofing textile fabrics.—W. H. S. will find on p. 58, vol. 24, directions for making plaster molds.—J. C. M. should use marine glue to cement leather to pasteboard. See p. 42. vol. 32.—G. M. B. will find an answer to his query as to a motionless point on the circumference of a vehicle wheel in motion on p. 298, vol. 31.—W. H. P. should use coal tar from gas works for his concrete walks. See p. 185, vol. 33.

(1) F. B. L. says: How can I make automatic apparatus to regulate the heat in the incubator of which you speak in a recent issue? I use a lamp for heating, with a water radiator. A. Arrange a metal tube, which by its expansion and contraction will act upon the pinion of the lamp, raising or depressing its wick so as to increase or diminish the heat within the desired range. Some of the automatic dampers to heating apparatus are constructed on a similar principle; but they act upon the supply of air and not upon the supply of fuel, as this would in this case.

(2) G. I. J. says: 1. Please give me a recipe for cleaning smoky walls and ceilings. A. Wash with water and sponge, and scrape the walls, etc., with a dull-edged scraping knife, carefully, in such a manner as not to break the surface; then apply a coat of sizing consisting of hot water into which sufficient glue has been dissolved to thicken it; when this is dry, apply two coats of whiting with a soft brush, the second after the first is dry. 2. What is a good substitute for whitewash for indoor use? A. Use kalsomine. See p. 337, vol. 34.

(3) H. H. F. says: In your issue of April 29, you publish an engraving of a gravel and charcoal filter. How many gallons of ordinary river water would such an apparatus filter per hour? A. This question can probably best be answered by our first correspondent, who furnished us with the sketch of the filter referred to. If he has the filter in operation, he will be able to determine this point by actual experiment. Will he do so, and give us all the data and results of the test?

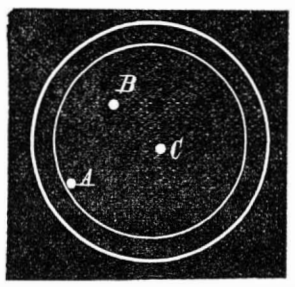
(4) F. S. S. asks: Is there such a carpenter's tool as a saw gage, consisting of a narrow thin strip of iron or steel running along the length of the hand saw, each end turning edgewise? The gage strip should be raised or lowered to suit the depth to which the saw is required to cut. A. Yes; there are such appliances already in use.

(5) D. C. P. and many others.—Rubber belts are, we think, in most cases superior to leather ones; the point, however, is a disputed one.

(6) R. N. Y. asks: Is there any kind of cement that can be used for closing up small cracks in a floor, that cannot be swept out, which, when water is put on the floor, will not get soft? A. If your floor is of wood, a cement of white lead and asphalt might answer the purpose; if of stone or like material, take Portland cement of the best manufacture.

(7) E. L. says: Water sometimes collects in my cellar to the depth of 2 or 3 feet, and remains there for several weeks. The ground around the house is so level that there is no chance of draining by ditching; neither will the water run away from the house if pumped out of the cellar. What can I do to prevent the trouble? Shall I dig up the bottom of the cellar when it gets dry, about 3 or 4 inches deep, and then pound in small stones and cover over with water lime, and plaster the sides of the wall with the same? Do you think the water will press up the bottom and come into the cellar after such treatment? A. If your water lime is a good cement, it may succeed. Mix small stones, gravel, and sand together, and sufficient cement and water to bind it well into a solid mass when dry; lay this over the bottom of the cellar to 3 or more inches deep, and plaster a coat of the cement and sand over the top of this layer and upon the side walls about 1 inch deep.

(8) J. M. H. asks: Is there not an error in Professor Young's lecture, published on p. 245, vol. 34, where the Professor speaks of a pendulum vibrating in a mine 500 feet below the surface? A. Professor Young's statement is perfectly correct, depending on the curious theorem, first proved by Newton, that a body in a hollow spherical shell is attracted equally in all directions, no matter where the body is placed. Thus a body at



A, B, or C would be in perfect equilibrium, if the shell be of equal density. Therefore, if the earth were a sphere of equal density, "a pendulum carried to the depth of 500 feet would vibrate as though it were on the surface of a sphere, having a radius 500 feet shorter than that of the earth."

(9) C. A. B. asks: 1. What is the best material for a horse stable floor? I want something which will not absorb moisture. A. Brick set in cement makes a very good floor for horse stables. 2. Is the material made from gas tar and called asphalt as good as asphalt taken from the earth? A. No.

(10) R. M. says: I want sometimes to keep the heat from my stove away from my boiler. Can I do this by putting a pipe between the stove and the boiler, with a damper accessible from the outside? A. Run a coil of iron pipe around the inside of your stove near the top, and connect one end of it with the bottom of the boiler and the other end with the top. Also, a little way from the side of the boiler provide an upright pipe connecting with the said upper and lower branches. Place a cock on each branch near the boiler and one on the upright pipe; by means of these cocks you can make the hot water circulate through the boiler or through the upright pipe in place of the boiler; in the latter case the upright pipe must extend above the upper branch and be open at the end to discharge steam. The boiler is supposed to be an open one.

(11) C. C. W. asks: 1. If a bell weighing 1 lb. were made into a flat piece, of the same thickness as before, would it not make the same sound as in the former shape? A. No. 2. Why? A. Because the bell does not vibrate as a whole, but with a reciprocal movement of the opposite sides.

(12) J. T. asks: You recently published a recipe for making a cement to mend glass and other articles, with chrome cement, made of a solution of acid chromate of lime. Please give directions for making the solution. A. The acid or bichromate of lime is obtained as a by-product in the manufacture of bichromate of potassa. The chrome ore is decomposed by roasting it, in a fine powder, intimately mixed with chalk. The roasted mass is then ground with water, and sulphuric acid added till the liquid has an acid reaction, in which case the bichromate of lime is formed and remains in solution. The salt is purified by crystalization.

(13) A. B. asks: Is there a process by which india rubber can be deodorized? A. We do not know of any.

(14) J. H. C. says: You state that, by the addition of soap, when brandy, spirit of wine, or alcohol is distilled, it loses its empyreumatic odor and taste. A friend says that you cannot get up a heat higher than 212° Fah., without confining the steam, that alcohol boils at 178° Fah., that all the alcohol would pass over at 186°, that all the water would pass over in vapor at 212°, and that the temperature could not be raised to 215° without confining the steam, and that there would not be any wood spirit in brandy, spirit of wine, or alcohol to pass over. Please explain. A. The alcohol distils over at a temperature of 173° Fah.; and when the distillation is complete, by simply raising the temperature to 215°, the volatile or empyreumatic oils that have been retained by the soap are expelled, and it is thus revivified for subsequent use.

(15) P. J. M. asks: What can be put into printers' ink to make it dry quickly? A. Use a quantity of good litharge.

(16) F. C. W. asks: How can I petrify dry white pine wood? A. Subject the wood for some time to a high steam pressure for several hours, and then introduce a strong aqueous solution of chloride of calcium, and continue the pressure for some time longer; finally place in a large vessel, and cover with a strong solution of water glass (silicate of soda), made by boiling the silicate in water.

(17) W. B. S. says: I find that, in your issue of January 16, 1875, you say that oil in which steel is repeatedly hardened will not lose its hardening property. J. E. E., of Pa., says it will. On which side is the weight of experience? A. The oil does not lose any of its original qualities if kept at a standard specific gravity, and free from impurities.

(18) C. G. W. asks: To what percentage is ordinarily pure air vitiated by being breathed once? A. The air which has passed through the lungs in the ordinary process of respiration is by no means deprived of its oxygen; it usually contains about 4 per cent only of carbonic acid. The greater portion of the air which is expelled during expiration has not proceeded further than the larger ramifications of the bronchia.

(19) J. E. R. asks: Can lard be adulterated with sulphate of zinc? I hear that this can be done, and that the poisonous effect can be removed, and that the lard will then hold 20 or 25 per cent of water. A. This method of adulteration is somewhat unusual. If you suspect any sample of lard of having been treated in this manner, send it to us, and we will be happy to examine it for you.

(20) C. T. McM. says: 1. I see in your answers in "Notes and Queries" the dimensions of engines given as 2 x 10, 10 x 24, etc., the stroke being from two to five times the bore. Could you not get the most power for the least steam by having the bore as large as, if not a little larger than, the stroke? A. No. 2. How much power would an engine, 3 inches stroke x 4 bore, have, and where should it cut off to work most economically? A. The question is too indefinite to admit of a specific answer. 3. How large a boiler would such an engine need? A. Make it 2 feet in diameter and 3½ feet high.

(21) J. L. R. says: We have a steam cylinder that has been cracked by fire just behind the rim which holds the head on. The crack extends half way round the cylinder. Now could it be closed by rods extending through both heads, thus drawing both heads together? A. Put a sleeve over the cylinder, and drive a rust joint.

(22) J. F. says: How can I make a varnish that will stick to wood, resist the action of brine, dry quickly, and be durable and incapable of imparting a flavor to anything that may come in contact with it? A. Try the following: Melt together in an iron vessel equal parts of common pitch and gutta percha. This may be employed hot or kept liquid under water.

(23) T. C. Jr. asks: How much more water will a pipe 2 inches in diameter run in an hour than a 1 inch pipe? A. A 2 inch pipe has 4 times the cross section of a 1 inch pipe, and a proportionate delivery, other circumstances being similar.

(24) D. K. says: In reply to P. M. H. A. K., who asked how many horse power it will take to run a 60 inch circular saw through a 2 feet log of hemlock or oak, your answer was "ordinarily about 20 horse power to every 1 inch of saw." We have a mill in which the saw runs two revolutions while the engine runs one. Will it not require more power to run this saw with a specified amount of feed than it would to run one connected directly on to the shaft of the engine? A. Yes. —J. E. E., of Pa.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. W. F.—No. 1 is red hematite. No. 2 is oxide of iron.—C. B. N.—It is finely divided silicate of alumina. It is not injurious to the boiler.—H.A.B. —The china cement consists of pure (bleached) shellac; but it probably contains some resin.—H. M. H.—We should be happy to see a specimen of the tin ore mentioned.—S.—Send us a sample of the white stamping powder in question.—O. A.—Your statement is remarkable, but we cannot identify the plant from your description.—A. H. R. & H. L.—It contains sulphide of antimony, sulphur, nitrate of strontium, nitrate of potash, and gunpowder. The pyrotechnic recipes given on p. 235, vol. 32, are standard representations.

R. F. J. says: I have in my possession a hard boiled egg which is all white, without a particle of yolk in it. When I had half shelled it, noticing the peculiar odor, I cut it and found it of a uniform very light yellow throughout. Can any one explain this?—A. H. H. asks: How can I make red, blue, purple, and black ink, for printing with rubber stamps? How can I make indelible ink for the same purpose?

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Railroad Fares to Philadelphia. By F. C.
On the Time Lost by the Stars. By J. H.
On the Extraction of Gold. By J. T.

Also inquiries and answers from the following:

J. W. H.—O. W.—J. A. H.—H. M. W.—J. R.—J. L.H. —J. A. K. E.—M.—E. E .R.—R. T. S.—G. U. D.—J.J. —A. G. H.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who makes machines for spinning curled horsehair? Who sells hand punches and shears suitable for cutting out plowshares and moldboards? Who sells machinery for preparing ramie fiber? Who makes machines for molding stearin candles? Who sells manganese?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

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[OFFICIAL]

INDEX OF INVENTIONS

FOR WHICH

etters Patent of the United States were Granted in the Week Ending.

May 16, 1876,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn &Co., 37 Park Row, New York city.

Abdominal supporter, F. H. Sale 177,569
Alarm, burglar, C. H. Pierce 177,555
Alarm signal, audible, N. J. Holmes 177,398
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Box, packing, J. E. Tarbox 177,588
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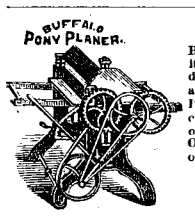

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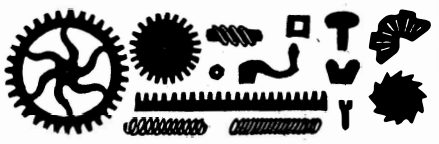

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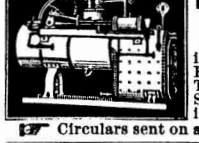

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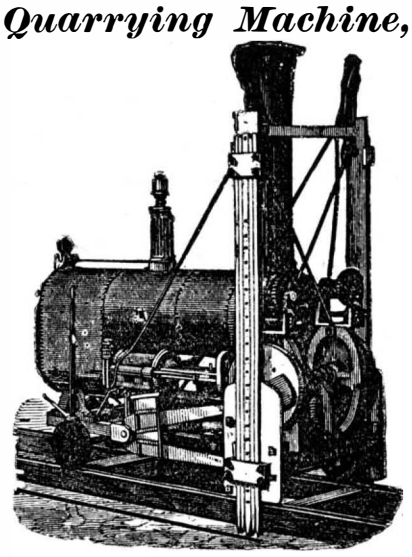

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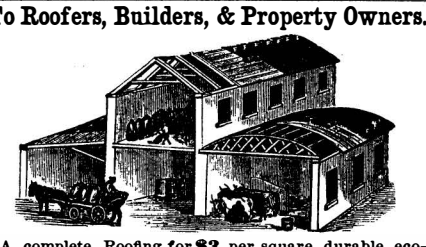

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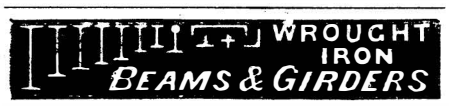

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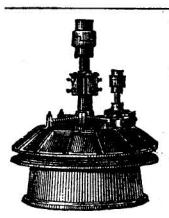

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